DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

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CECW-EC

Technical Letter
No. 1110-2-573

30 September 2008

EXPIRES 30 SEPTEMBER 2013

Engineering and Design
CONSTRUCTION COST ESTIMATING GUIDE FOR CIVIL WORKS

1. Purpose. This engineer technical letter establishes uniform guidance to describe methods, procedures, and formats for the preparation of construction cost estimates and construction contract modification estimates and total project costs.

2. Applicability. This engineer technical letter applies to U.S. Army Corps of Engineers commands having design and/or construction responsibilities for civil works projects.

3. Distribution Statement. Approved for public release, distribution is unlimited.

4. References. See appendix A.

10 Appendixes
(See Table of Contents)

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CHAPTER 1

Introduction

1.1 Purpose. This engineer technical letter (ETL) establishes uniform guidance to describe methods, procedures, and formats for the preparation of construction cost estimates, Independent Government Estimates (IGEs), construction contract modification estimates and the Total Project Cost (TPC). The definitions and appropriate policies applicable to the wide variety of projects encompassed in the Civil Works Program are described in Engineer Regulation (ER) 1110-2-1302, Civil Works Cost Engineering, and ER 1110-2-1150, Engineering and Design for Civil Works Projects. The technical details for preparing cost estimates are provided in this ETL to accomplish the requirements of ER 1110-2-1302.

1.2 Applicability. This ETL applies to U.S. Army Corps of Engineers (USACE) commands having design and/or construction responsibilities for civil works projects.

1.3 Distribution Statement. Approved for public release, distribution is unlimited.

1.4 References. Required and related references are at appendix A.

1.5 Scope.

1.5.1 This ETL provides technical guidance and addresses all phases of construction cost estimating from planning phases through modification estimates during construction through to project completion for all civil works projects. The term “construction” includes remedial action environmental projects, dredging, and other construction and fabrication-related work often implemented within all types of contracts.

1.5.2 This ETL includes guidance for preparing and reporting the TPC and computing maximum project cost legislated by Section 902 of the Water Resources Development Act of 1986. The basis for computing maximum total project cost is in appendix G of ER 1105-2-100, Planning Guidance Notebook.

1.5.3 For the purposes of this document, the term cost engineer applies to all individuals, whether employed by the Government or under contract to the Government, who are engaged in the preparation or review of cost estimates.

1.6 Program Specific Requirements. To support the civil works missions addressed in ER 1105-2-100, guidance for civil works estimates is provided in ER 1110-2-1302 and ER 1110-2-1150. Appendix A contains other pertinent references. Other

regulations govern military estimates and hazardous, toxic, and radioactive waste and will not be discussed in this ETL.

1.7 Document Organization. The ETL consists of 9 chapters, 10 appendixes, and a glossary.

1.7.1 Chapter 1 provides the scope, civil works project requirements, background, and responsibilities of construction cost estimating.

1.7.2 Chapter 2 discusses the types of cost estimates employed during construction cost estimating. Virtually every study, project, or activity funded under the civil works project requires a project cost estimate. The cost estimate is an essential tool that serves as a foundation in accomplishing management objectives, budgetary submissions, and economic analysis.

1.7.3 Chapter 3 applies to construction estimates and describes the basic principles and responsibilities for developing any cost estimate.

1.7.4 Chapters 4 and 5 provide direct and indirect cost development guidelines.

1.7.5 Chapter 6 provides guidance on identifying other costs that must be included in the cost estimate, i.e., risk, contingency, and escalation.

1.7.6 Chapters 7 and 8 discuss IGEs and IGEs for contract modifications.

1.7.7 Chapter 9 discusses various levels of review. Certain reviews are mandatory and directed by headquarters (HQ).

1.7.8 The following appendixes contain supportive material to the main text in this ETL: Appendix A, References; Appendix B, Total Project Cost Summary; Appendix C, Tri-Service Automated Cost Engineering Systems; Appendix D, Preparation of Dredge Cost Estimates; Appendix E, Sample Estimate Sheets and Forms; Appendix F, Sample Quality Review Checklist; Appendix G, Cost and Schedule Risk Analysis; Appendix H, Sample Checklist for Cost Estimate Preparation or Reviewer Checklist; Appendix I, Protests or Litigation Concerning the Independent Government Estimate; and Appendix J, Job Office Overhead Template.

1.8 Background. Project cost estimates shall be prepared as though the Government were a prudent and well-equipped contractor estimating the project. Therefore, all costs, which a prudent, experienced contractor would expect to incur, should be included in the cost estimate. This philosophy prevails throughout the entire project cycle--from planning through completion of the project. Without an accurate estimate or schedule, successful project management can be compromised. Each estimate shall

be developed as accurately as funding and time constraints allow, in as much detail as can be assumed, and based upon the best information available. The objective through all phases of project planning, design, and construction is to develop cost estimates to serve as a project management tool as well as establish a “fair and reasonable” cost to the Government.

1.9 Project Delivery Team.

1.9.1 USACE is committed to effective management of the scope, quality, cost, and schedule of each project by using project delivery teams (PDT). ER 5-1-11, USACE Business Process, presents the requirements for establishing a PDT for all projects. Each PDT is led by a project manager (PM) and composed of everyone necessary for successful development and execution of all phases of the project. The PDT may be drawn from more than one USACE district and may include specialists, consultants/contractors, stakeholders, or representatives from other Federal and state agencies. Team members are chosen for their skills and abilities to successfully execute a quality project. The project cost estimate shall be recognized as a major management tool for establishing, monitoring, and managing costs from the study phase through project completion.

1.9.2 Civil works projects are planned and approved following ER 1105-2-100 and are designed following ER 1110-2-1150.

1.9.3 The efforts of all PDT members shall be coordinated to ensure that sufficient project information is provided for all cost estimates.

1.9.4 Cost engineers are an important member of the PDT. The cost engineer is expected to have a clear understanding of those responsibilities and areas where he or she can contribute. It is imperative that the team concept be enhanced and supported by each PDT member. As such, the cost engineer is encouraged to lead in cost issues and provide ideas for cost control and sharing measures.

1.10 Responsibilities.

1.10.1 Division Cost Engineer

- Act as Major Subordinate Command (MSC) point of contact in communicating with HQUSACE cost engineering offices.
- Receive, interpret, disseminate, and implement cost engineering guidance, direction, and correspondence from higher authority in a timely manner.
- Conduct field reviews of district commands execution of cost quality management and recommends necessary corrective actions when warranted.
- Support PM in the certification for project cost estimates and cost changes and provide Project Review Board technical support on project costs as required.

- Review proposed awards of negotiated contracts and modifications requiring award approval above the authority delegated to district commanders.
- Review bid results, protests, and mistakes in bids. Evaluate and make recommendations on district actions for bid protests and mistakes in bid. Provide analysis and recommendations and take necessary actions as required.
- Participate in HQUSACE Cost Engineering Steering Committee and lead in subcommittee efforts.
- Provide technical assistance to districts and MSC elements on cost engineering issues. Consolidate and disseminate MSC-wide historical cost data.
- Provide technical support to HQUSACE on development, upgrade, maintenance, and implementation of Microcomputer Aided Cost Estimating System (MCACES).

1.10.2 Chief, Cost Engineering

1.10.2.1 The chief of each district cost engineering office is responsible for providing cost engineers to support the PDT. The chief shall ensure that all appropriate estimating activities, including site visits prior to construction and during construction, have been adequately funded and scheduled in the Project Management Plan (PMP) for the estimate development. When cost engineering products are to be obtained by architect-engineers (A-E) contracting, the chief shall ensure that the A-E contract statement of work requires the A-E to comply with USACE estimating policies of ER 1110-2-1150, ER 1110-2-1302, and this ETL.

1.10.2.2 The cost engineer should serve in an advisory capacity to the PDT, contracting office, and office of counsel related to contract acquisition strategy, bid schedules and biddability, TPC, value engineering, disputes, and claims.

1.10.2.3 Preparation and review of construction cost estimates from design start through project completion is the responsibility of the district cost engineering office. In concert with this responsibility, the cost engineer must be accountable for the completeness, quality, accuracy, and reasonableness of the cost estimate. This relates to all respective estimates, whether developed by the cost engineering office, other governmental offices, or by contracted estimating firms.

1.10.3 Estimating by Non-USACE or Engineering Firms. Preparation of Government estimate products are always inherently the responsibility of the Government. When it is necessary to contract services for estimate products, such services will be provided by competent firms or agencies experienced in cost and schedule engineering. The key responsibilities of any contracted estimate by other firm or agency include:

- Adherence to ER 1110-2-1150, ER 1110-2-1302, and this ETL.
- Providing an experienced cost engineer as lead for the product(s).
- Coordination with Corps cost engineering office during product development.
- Developing construction estimates at feasibility and beyond in the latest approved MCACES software.
- Developing construction schedules at feasibility and beyond utilizing industry accepted software programs.
- Receiving and adhering to Government approval of the Civil Works Work Breakdown Structure (CWWBS) in the early stage of estimate development.
- Maintaining and conducting an internal quality control/quality assurance (QC/QA) program addressing cost, schedule, and risk as contractually applicable.
- Preparing cost reports addressing contract scope, product development processes, assumptions, methodologies, concerns, and results.

1.10.4 Project Delivery Team

1.10.4.1 Members of the PDT shall provide the cost engineer estimates for the CWWBS feature codes 01 (Lands and Damages), 30 (Planning, Engineering, and Design), and 31 (Construction Management) for incorporation into the Total Project Cost estimate. All costs for these activities will be developed by the appropriate office and coordinated with the PM to ensure all schedules and commitments for the project are fulfilled.

1.10.4.2 Each PDT member is responsible for defining confidence/risk levels associated with their office products. The PDT shall assist the cost engineer in identifying cost-related project items including but not limited to:

- Project risks.
- Project contingencies.
- Project schedule.
- Construction schedules.
- Contract phasing.
- Bid schedule.
- Contract completion dates.

1.11 Technical Reviews. In accordance with ER 1110-2-1150, technical reviews are required and/or recommended during various phases of project development through the life of the project. These review requirements are more thoroughly discussed within ER 1110-2-1302. Technical reviews are to be coordinated by the PM and supported by the PDT. The reviews are instrumental in ensuring adequate product quality for the project phase under development. There are various cost quality processes that are

utilized for this purpose and are discussed more thoroughly in chapter 9. They include a district quality control review or DQC (also known as a peer review), an independent agency technical review (ATR), and an independent external peer review (IEPR).

CHAPTER 2

Types of Civil Works Cost Estimates

2.1 General.

2.1.1 Virtually every study, project, or activity funded under the Civil Works Program requires a cost estimate. The cost estimate is an essential tool that serves as a foundation in accomplishing management objectives, budgetary submissions, and economic analysis. In a typical project life, cost estimates may be divided into two types: budget estimates or Independent Government Estimates. The types of estimates and civil works phases are identified below:

2.1.1.1 Budget estimates for reconnaissance phase reports.

2.1.1.2 Budget estimates for feasibility phase reports.

2.1.1.3 Budget estimates during planning, engineering, and design phase.

2.1.1.4 IGEs for contract award and for contract modifications during the construction phase.

2.1.2 Budget estimates reflect the early stages of design. As designs evolve and improve in scope and detail, so shall the estimates in detail and quality. The IGE is the most detailed estimate and must be a stand-alone document reflecting scope and basis of estimate.

2.1.3 Regardless of the type of estimate, detailed estimating methods are to be employed as much as possible in relationship to the known and assumed design scoping information. Details can be reasonably assumed for many projects from experience gained in past designs and estimates. When details cannot be reasonably assumed, then historical bid unit prices shall be used, but updated to current market costs. While cost quotes can be used, caution should be exercised to establish those costs as reliable, fair, and reasonable. Verification of reasonable quotes can be achieved by receiving several quotes, making parametric comparisons, or developing a rough estimate for comparison.

2.2 Estimate Structure.

2.2.1 The estimate structure is strongly related to feature levels and accounting, contracts, and acquisition; construction costs and unit pricing; project schedules and escalation; and risk and contingency development in the endeavor to establish the TPC (paragraph 2.3.4) that becomes the baseline cost estimate (BCE)

upon approval (higher authority or Congress). It is important that the structure of all estimates be as consistent as possible. The purpose for a consistent estimate structure is to: (1) serve as the basis for establishing the TPC; (2) provide an organized manner of collecting project cost data for cost reporting and cost tracking; (3) provide a checklist for categorizing costs; (4) provide a basis to maintain historical cost data; and (5) portray logical sequence of work to support work preparation of a construction schedule.

2.2.2 The CWWBS is a standard product oriented structure that identifies all civil works related project requirements that include construction costs and the non-construction activity costs for Planning, Engineering, and Design and Construction. The CWWBS groups the products by feature (table 2-1) and requires further expansion to the appropriate title and detail level necessary to ensure all product specific work tasks are included for preparation of the TPC estimate.

Table 2-1. Civil Works Work Breakdown Structure

(Feature and Subfeature Levels)		
CWWBS Number		Description of Item
01	**--**	**LANDS AND DAMAGES**
01	18	GENERAL REVALUATION REPORT (GRR)
01	19	LIMITED REVALUATION REPORT (LRR)
01	20	PROJECT DESIGN MEMORANDUM
01	21	FEATURE DESIGN MEMORANDUM
01	23	CONSTRUCTION CONTRACT(S) DOCUMENTS
02	**--**	**RELOCATIONS**
02	01	ROADS, Construction Activities
02	02	RAILROADS, Construction Activities
02	03	CEMETERIES, UTILITIES, AND STRUCTURES, Construction Activities
03	**--**	**RESERVOIRS**
04	**--**	**DAMS**
04	01	MAIN DAM
04	02	SPILLWAY
04	03	OUTLET WORKS
04	04	POWER INTAKE WORKS
04	05	AUXILIARY DAMS
04	06	MUNICIPAL AND INDUSTRIAL WATER DELIVERY FACILITIES
05	**--**	**LOCKS**
06	**---**	**FISH AND WILDLIFE FACILITIES**
06	01	FISH FACILITIES AT DAMS
06	02	FISH HATCHERY, (Including Trapping and Release Facilities)
06	03	WILDLIFE FACILITIES AND SANCTUARIES
07	**--**	**POWER PLANT**
07	01	POWERHOUSE
07	02	TURBINES AND GENERATORS
07	03	ACCESSORY ELECTRICAL EQUIPMENT
07	04	MISCELLANEOUS POWER PLANT EQUIPMENT

(Feature and Subfeature Levels)

07	05	TAILRACE
07	06	SWITCHYARD
08	**--**	**ROADS, RAILROADS, AND BRIDGES**
08	01	ROADS
08	02	RAILROADS
09	**--**	**CHANNELS AND CANALS (Except Navigation Ports and Harbors)**
09	01	CHANNELS
09	02	CANALS
10	**--**	**BREAKWATERS AND SEAWALLS**
11	**--**	**LEVEES AND FLOODWALLS**
11	01	LEVEES
11	02	FLOODWALLS
12	**--**	**NAVIGATION, PORTS AND HARBORS**
12	01	PORTS
12	02	HARBORS
13	**--**	**PUMPING PLANT**
14	**--**	**RECREATION FACILITIES**
15	**--**	**FLOODWAY CONTROL AND DIVERSION STRUCTURES**
16	**--**	**BANK STABILIZATION**
17	**--**	**BEACH REPLENISHMENT**
18	**--**	**CULTURAL RESOURCE PRESERVATION**
19	**--**	**BUILDINGS, GROUNDS, AND UTILITIES**
20	**--**	**PERMANENT OPERATING EQUIPMENT**
30	**--**	**PLANNING, ENGINEERING, AND DESIGN**
30	11	PROJECT COOPERATION AGREEMENT
30	12	PROJECT MANAGEMENT PLAN
30	18	GENERAL REEVALUATION REPORT (GRR)
30	19	LIMITED REEVALUATION REPORT (LRR)
30	20	PROJECT DESIGN MEMORANDUM
30	21	FEATURE DESIGN MEMORANDUM
30	23	CONSTRUCTION CONTRACT(S) DOCUMENTS
30	24	VALUE ENGINEERING ANALYSIS DOCUMENTS
30	25	PROJECT OR FUNCTIONAL ELEMENT CLOSEOUT
30	26	PROGRAMS AND PROJECT MANAGEMENT DOCUMENTS
31	**--**	**CONSTRUCTION MANAGEMENT**
31	12	PROJECT MANAGEMENT PLAN
31	23	CONSTRUCTION CONTRACT(S) DOCUMENTS
31	26	PROGRAMS AND PROJECT MANAGEMENT DOCUMENTS
32	**--**	**HAZARDOUS AND TOXIC WASTE**
32	01	MOB, DEMOB & PREPARATORY WORK
32	02	SYSTEMS STARTUP/OPERATIONS/MAINTENANCE
32	03	INSTITUTIONAL ACTIONS
32	04	SURFACE WATER CONTROL
32	05	COLLECTION & INJECTION OF GROUND WATER
32	06	COLLECTION & DISPOSAL OF WASTES
32	07	CONTAIN & RESTORE CONTAMINATED GROUND WATER
32	08	CONTAINMENT FOR WASTES
32	10	TREAT-WASTES/CONTAMINATED SOIL & WATER
32	11	AIR POLLUTION AND LANDFILL GAS CONTROL

(Feature and Subfeature Levels)

32	12	INNOVATIVE TECHNOLOGIES
32	13	SUPPORTING FACILITIES
32	14	PRIME CONTRACTOR'S INDIRECT COST

2.3 Estimates for Reconnaissance Phase.

2.3.1 Preliminary Cost Estimates

2.3.1.1 During the reconnaissance study phase of various alternatives, the cost engineer shall prepare the preliminary construction cost estimates of those alternatives. The estimates shall be in constant dollars and based on the probable type and size of the project. They will include the following construction features: Lands and Damages; Relocations; environmental compliance and required mitigation; Planning, Engineering, and Design; Construction Management; and contingencies. Refer to the CWWBS.

2.3.1.2 The assignment of contingencies is very important at the reconnaissance stage of project study. Contingencies are necessary to assure that unforeseen items of work or level of detail discovered later will not jeopardize the project recommended in the reconnaissance study report as one worthy of progressing to the feasibility phase. Contingency values may vary between various alternatives and should be considered if the various alternatives technically differ and carry significant risk differences.

2.3.1.3 While not required, escalation may be considered if the project alternatives differ significantly in duration or if they carry forward into multiple years.

2.3.1.4 For cost estimates prepared manually, rounding of costs is desirable to avoid using decimals.

2.3.2 Design Detail. Design detail will be limited at this stage of project development. The cost estimating method used must establish reasonable costs sufficient to support a planning evaluation process for determining whether a study should continue into the feasibility phase. Alternative plans may need to be considered before an acceptable plan is selected. Good judgment and experience of the estimating team is needed and required for preparing estimates in a method and format suitable for comparing the various alternatives studied.

2.3.3 Preparation and Content

2.3.3.1 Once it has been determined that a Federal interest is appropriate, a method of development and format must be determined. A cost estimate for the selected plan may be prepared using the latest HQUSACE approved MCACES

software in the CWWBS format to a level of detail necessary to support the preliminary scope.

2.3.3.2 The reconnaissance report will contain the cost estimate and will include:

- Title page.
- Table of contents.
- Narrative.

2.3.4 Basis of Reconnaissance Estimates

2.3.4.1 Construction cost estimates for the reconnaissance phase may be developed using quotes, calculations, unit prices, or historical data as backup

2.3.4.2 As an alternate method to detailed task-by-task estimate preparation, especially in the early phases of project and budget development when details are not available, the use of parametric estimating may be incorporated. Parametric estimating is the process of using various factors to develop an estimate. The factors are based on engineering parameters, developed from historical databases, construction practices, and engineering/construction technology. Parameters include physical properties that describe project definition characteristics (e.g., building size, building type, foundation type, exterior closure material, roof type and material, number of floors, functional space requirements, interior utility system requirements, etc.). The appropriateness of selecting the parametric method depends upon the extent of project definition available, the similarity between the project and other historical data models, the ability to calculate details, and known parameters or factors for the project. Appendix C provides additional information on automated parametric systems.

2.4 Estimates for Feasibility Phase.

2.4.1 Comparative Cost Estimates

2.4.1.1 Comparative cost estimates of the viable alternatives used in selecting the National Economic Development (NED) plan must be prepared in the CWWBS structure to at least the subfeature level. A screening process may be used in the feasibility phase to review all the initial alternatives. Different levels of cost estimating detail may be appropriate at each level of screening. Typically, this screening process will narrow the number of alternatives to a final list, i.e., two to five viable alternatives for a more detailed assessment.

2.4.1.2 Historical bid cost data, experience, and/or unit prices adjusted to expected project conditions are acceptable methods of developing project costs for these alternatives. The cost estimate for each viable alternative will include appropriate

comments describing the method of construction, assumptions used in developing the estimate, and the technical/design data available. For the recommended plan (normally the NED plan), sufficient engineering and design are performed to refine the project features.

2.4.2 Recommended Plan Cost Estimate and Schedule

2.4.2.1 The cost estimate supporting the NED plan will be prepared using the latest HQ approved MCACES software and the established CWWBS to at least the subfeature level of detail. In general, the unit costs for the construction features will be computed by estimating the equipment, labor, material, and production rates suitable for the project developed.

2.4.2.2 Detailed estimating methods are to be employed whenever adequate design information is known or can be reasonably assumed. This requirement is related to total project scope or specific scope portions that are developed adequately for detailed estimating in any product phase. Detail can be reasonably assumed for many projects from experience in past designs, cost engineer experience, and use of parametric models or templates. When details cannot be reasonably assumed, then historical bid unit prices shall be used, but updated to current market costs. While cost quotes can be used, caution should be exercised to establish those costs as reliable, fair, and reasonable. Verification of reasonableness can be achieved by receiving several quotes, making parametric comparisons, or developing a rough estimate for comparison.

2.4.2.3 Upon completion of the construction estimate, a representative construction schedule shall then be developed in support of the escalation calculations for the Total Project Cost Summary (TPCS). The schedule and its logic can be used as a quality check of the estimate as related to duration, overtime, and the number of crews and shifts. The schedule logic may cause the estimate to be revised based upon the schedule needs established for the project. The schedule shall be developed in enough detail to portray the critical and near critical path construction elements as well as critical concurrent activities.

2.4.3 Total Project Cost and Summary

2.4.3.1 The TPC reflects the costs for all features of the CWWBS specifically related to the project. The TPCS provides a summary of the TPC estimate and should reflect the CWWBS feature levels as presented in table 2.1 for the feature costs. A TPCS shall be prepared in conjunction with the preparation of the BCEs, which support major project milestones. Guidance and preparation details are presented in appendix B. The TPCS relates the cost estimate and identified price level date to the fully funded cost estimate by applying the appropriate adjustments for contingency and escalation in accordance with the developed project schedule. In a sense, it is a reflection of three

estimates: Current price level of the Baseline Estimate, Budget Year Baseline Estimate, and Fully Funded Estimate. Appendix B includes a representation of the three estimates.

2.4.4 The TPCS is the required cost estimate document to be submitted with all projects sent for either division or HQUSACE approval. Both the PM and chief of the cost engineering office shall review, approve, sign, and date all TPCS documents. Real estate estimates included in the TPCS shall be reviewed and approved, and the TPCS signed by the chief or designee of the real estate office. Signature by the chief of the cost engineering office affirms that the construction feature costs are correct and that the backup data provided for the non-construction features (Lands and Damages; Planning, Engineering, and Design; and Construction Management) have been included.

2.4.5 Baseline Cost Estimate. The TPCS accompanying the feasibility report is used for project authorization and is the basis for allowable cost increases without reauthorization (ER 1110-2-1150). The TPC at the time the project is authorized by Congress becomes the BCE. The BCE represents the scope and schedule established in the feasibility report. The cost estimate based on constant dollars is used for authorization purposes (ER 1105-2-100).

2.4.6 Baseline Project Schedule. The primary engineering objective during the feasibility phase is to provide engineering data and analyses sufficient to develop the complete project schedule and cost estimate. Engineering data and analyses in the feasibility phase shall be sufficient to develop the complete project schedule and TPC with reasonable contingency factors for each cost item or group of cost items (ER 1110-2-1150).

2.4.7 Preparation and Content. The cost engineering appendix of the feasibility report will contain the MCACES cost estimate developed by the cost engineer and will include:

- TPCS (all feature levels).
- Title page.
- Table of contents.
- Narrative presentation of the estimate, schedule, qualifications, project concerns, risks, and contingencies.
- Summary Sheets for Owner, Indirect, and Direct Costs reported at all levels down to the subfeature level.

2.5 Estimates During Engineering and Design Phase.

2.5.1 General

2.5.1.1 Engineering and design is performed during the early phases of project development and during construction. First, engineering occurs in the preconstruction engineering and design phase during which all detailed technical studies and design needed to begin construction of the project are completed, e.g., award of the first construction contract. After initial contract award, engineering continues and includes the completion of all design for the remaining contracts and the design to support ongoing construction required during the construction period.

2.5.1.2 ER 1110-2-1150, appendix D states, "…the baseline estimate in the defined work breakdown structure must be continuously updated, as the design is refined." It also states, "A total current working estimate must be prepared at each major milestone in the project development."

2.5.2 Value Engineering Estimates

2.5.2.1 Value engineering has been defined as a systematic method to improve the "value" of goods and services by using an examination of function. Value, as defined, is the ratio of function to cost. Value can therefore be increased by either improving the function or reducing the cost. It is a primary tenet of value engineering that basic functions be preserved and not be reduced as a consequence of pursuing value improvements. Value engineering also applies to life cycle cost (LCC) analyses. Value engineering is specifically discussed within Public Law (PL) 104-106, which states, "Each executive agency shall establish and maintain cost-effective value engineering procedures and processes."

2.5.2.2 Districts and divisions have established a value engineering officer in response to these requirements. During the course of design and estimate development, there will likely come a period of opportunity where scope development warrants a value engineering study. The cost engineer may be called upon to participate in these value engineering studies.

2.5.3 Total Project Cost Estimates

2.5.3.1 Project cost estimates during preconstruction engineering and design are primarily revisions to the TPC due to refinements or changes in the design and/or progress schedule developed in the feasibility study. As the project is developed and the design is refined, the BCE must be used as a guide in managing the engineering and design process. A cost estimate represented by a TPCS must be prepared and included as a part of any required Design Documentation Report, Engineering Documentation Report, GRR, or LRR. The cost estimate documentation required for

any of these project submissions requiring HQUSACE or higher approval will be the same as discussed above for estimates for the feasibility phase.

2.6 Independent Government Estimates for Contract Award.

2.6.1 Requirement

2.6.1.1 An IGE is required for award of each construction contract, in excess of $100,000 (Federal Acquisition Regulation [FAR]/ Engineer FAR Supplement [EFARS]. Chapter 7 provides detailed information on IGEs.

2.6.1.2 PL 95-269 requires that no work of river and harbor improvement will be performed by private contract if the contract price is more than 25 percent in excess of the estimated comparable cost of doing the work by Government plant or more than 25 percent in excess of a fair and reasonable estimated cost (without profit) of a well-equipped contractor performing the work.

2.6.2 Preparation and Content

2.6.2.1 The IGE shall be prepared by the cost engineer using the latest HQ approved MCACES software. The cost engineer will participate in all negotiated contracts including, but not limited to, Small Business and Small Business Section 8(a), Service and Supplies, and/or cost plus contracts.

2.6.2.2 IGE detailed estimates shall be prepared as though the Government were a prudent and well-equipped contractor estimating the project. Therefore, all costs, which a prudent, experienced contractor would expect to incur, should be included in the cost estimate in as much detail as possible. The detailed estimate remains “For Official Use Only” (FOUO) until the construction contract is closed.

2.6.2.3 The IGE for bidding purposes is comprised of the title page, signature page and the bid schedule. It does not include the detailed estimate. The IGE shall be designated FOUO until after bid opening (paragraph 7.7.2).

2.6.3 Directives. Those responsible for the preparation of estimates should be thoroughly familiar with the requirements of the appropriate ERs, FARs, Defense FAR Supplements (DFARS), and EFARs. While this ETL discusses IGE preparation, the FARs present the processes related to IGE preparation as well as bid evaluation, protests, modifications, disputes, claims and resolution.

2.6.4 Approvals. Approval signatures signify that the estimate was prepared by qualified personnel, independently reviewed by qualified personnel, and reflect the requirements and processes of the pertinent regulations. IGEs for contracts or modifications exceeding $100,000 shall be approved by the chief of cost engineering.

The IGE shall be approved, dated, and signed by the district commander or approved designee. The IGE will be included in the contract documentation and is subject to the final approval of the contracting officer (EFAR 1.602).

2.7 Estimates for Contract Modifications and Other Negotiated Procurement.

2.7.1 Requirement. FAR Part 36 requires an independently prepared Government estimate for modifications in excess of $100,000. Normally, estimates are not required for changes less than $100,000 but are recommended to support negotiations. IGEs are required by the contracting officer for unilateral modifications. Further, for contract modifications, the amount refers to the sum of the absolute value of increases and decreases. For example, a modification containing an increase of $60,000 and decrease of $45,000 has an absolute value of $105,000, therefore, an IGE would be required.

2.7.2 Preparation and Content. IGEs for contract awards and contract modifications are treated the same. In some cases, portions of the cost estimate may be revealed only to the extent determined necessary by the negotiator to settle disputed items of work. The total of the IGE will not be released during negotiations. On occasion, important information has been revealed through negligence by allowing the estimate to lay open upon the negotiation table. The FOUO (paragraph 7.7.2) designation will be removed after issuance of a signed modification.

2.7.3 Approvals. IGEs for contract actions less than $100,000 that occur during construction shall be approved by the administrative contracting officer or appointed designee. For other contract actions including those exceeding $100,000, the approval of the estimate shall be the chief of cost engineering (as appropriate) or the contracting officer's appointed designee. When the IGE is changed during or subsequent to conferences or negotiations, the details of the basis for the revision or changes in price shall be fully explained and documented in the price negotiation memorandum. The IGE will be included in the contract documentation and is subject to the final approval of the contracting officer or administrative contracting officer.

2.8 Dredging Estimates.

2.8.1 Dredging estimates are developed somewhat differently, but still prepared by cost engineering as part of construction estimates. General guidance is provided in appendix D and ER 1130-2-250. The recommended software for dredge estimating is the USACE Cost Engineering Dredge Estimating Programs (CEDEP), which is developed within an Excel format.

2.8.2 Dredging estimates may be prepared electronically using the CEDEP software. CEDEP contains a narrative documenting reasons for decisions and selections made by the cost engineer. Software distribution is restricted because

CEDEP is considered proprietary to the Government and should not be distributed to A-Es or to contractors.

2.8.3 The CEDEP estimate results are then loaded into the latest MCACES software to support the total construction estimate. Each cost engineer should be aware of various techniques that have proven to produce the most accurate results for specific dredging projects. It is highly recommended that cost engineers are properly trained for estimating dredging projects. The methodology for cost estimating of pipeline, hopper, and mechanical dredging should be part of the course training.

2.8.4 Associated work items, such as clearing and grubbing, dike or weir construction, disposal area operation and maintenance, drilling and blasting, and environmental protection, are not included within CEDEP and should be estimated separately in accordance with other parts of this ETL and included within the MCACES estimate.

2.9 Life Cycle Cost Study Support.

2.9.1 LCCs encompass all costs associated with the product's life cycle. These include all costs involved in acquisition (research and development, design, production and construction, and phase-in), operation, support, and disposal of the product.

2.9.2 ER 1150-2-1150 and ER 1110-2-8159, Life Cycle Design and Performance and Civil Works Missions and Evaluation Procedures, require LCC analyses be performed to evaluate system alternatives. These analyses are the responsibility of the design team. The cost engineer may be required to support the analysis by providing cost input. As preparation to such responsibility, the cost engineer should be familiar with the LCC requirements in ER 1110-2-8159 and appendix E of ER 1105-2-100.

2.10 Estimates for Operation, Maintenance, Repair, Rehabilitation, and Replacement. This project phase is managed by operations division and is divided into two categories: major rehabilitation and all other work.

2.10.1 Major Rehabilitation. The development of major rehabilitation projects is based on an evaluation report, which is similar to a feasibility report in economic justification, evaluation of alternatives, and identification of a recommended plan. Cost estimates developed to evaluate alternatives considered in the report may be based on historical data. The cost estimate for the recommended plan shall be developed using MCACES and the CWWBS in the same format as a cost estimate for a feasibility report.

2.10.2 All Other Work. All Operation, Maintenance, Repair, Rehabilitation, and Replacement projects not meeting the criteria for major rehabilitation fall in

this category. The recurring nature of these projects facilitates the development of a historical database. This historical data lends itself well to use in MCACES for development of the cost estimates for these projects. The cost estimate for the recommended plan shall be developed using MCACES and the CWWBS in the same format as a cost estimate for a feasibility report.

2.11 Estimates to Support Other Programs.

2.11.1 Continuing Authorities Program. Continuing Authorities Program projects are often limited in scope, and initial planning studies are usually limited in time. Cost estimate preparation should still follow the guidance within this ETL, developing the estimates to the greatest level of detail as possible related to scope (reference paragraph 2.1.3) and utilizing the latest approved version of MCACES. These estimates must fully support the report recommendations with accurate cost data documented with the appropriate narrative.

2.11.2 Dam Safety Assurance Program. As stated within paragraph 2.1.3, detailed estimating methods are to be employed as much as possible in relation to the known and assumed design scoping information. An MCACES estimate shall be developed for the recommended plan. The level of the cost detail will vary with the design information available to support the project scope but shall be at least to the subfeature level of detail. A higher level of detail is recommended where possible to achieve the greatest accuracy to confidently establish the BCE. Although this baseline estimate is not subject to reauthorization if the Section 902 limit (of the Water Resources Development Act of 1986) is exceeded, the goal is to make every effort to adhere to the criteria of the 20 percent growth limitation. A program estimate shall be reflected within a TPCS structure with the costs separated to the subfeature level of the CWWBS. The MCACES estimate shall be accompanied by a narrative summary for the recommended plan.

CHAPTER 3

Preparing Construction Cost Estimates

3.1 General.

3.1.1 This chapter applies to the construction estimates within the responsibility of the cost engineering office. In the normal sequence of events throughout the preparation of any estimate, it is important to understand basic principles and responsibilities. This includes an understanding of the scope of work, the acquisition plan, determining the quantities, types of feature level costs and CWWBS, the cost and pricing sources, cost development, and supporting documentation. Basic elements of each estimate consist of:

3.1.1.1 Descriptions of work elements (tasks) to be accomplished.

3.1.1.2 Quantity of work required for each task.

3.1.1.3 Unit cost for each task quantity.

3.1.2 A unit cost for each task is developed to increase the accuracy of the estimating procedure and should provide a reference comparison to historic experience. Lump sum unit cost and unit pricing when used at the task level is discouraged, but if used must be documented. As design scope evolves, those lump sum costs should then be better defined.

3.2 Planning the Estimate.

3.2.1 Project Scope. The cost engineer must thoroughly understand the project scope of work, the biddability, constructability, and operability of the project being estimated. The cost engineer must also review drawings, specifications, and construction sequences and durations to determine total construction costs. A site visit is strongly recommended to enable the cost engineer to relate the physical characteristics of the project to the available design parameters and details. This is particularly important on projects with unusual site conditions, major maintenance and repair projects, alteration/addition projects, environmental projects, and dredging projects. The construction sequence must be developed as soon as possible and should be used to provide a checklist of construction requirements throughout the cost estimating process. The overall format of major cost elements in an estimate should be compatible with current standards, management needs, the anticipated price/bid schedule, and the appropriate CWWBS.

3.2.2 Project Acquisition Plan. It is strongly advised that the project acquisition plan or strategy be determined early within the project planning. This is normally established by a management Corporate Board or Contract Acquisition Board. The planned acquisition can influence cost. Acquisition examples include a competitive bid, a small disadvantage business, a sole source negotiated procurement, a design-build project lacking complete design, a construction or services contract, etc. If no plan has been established, the estimator must make a major assumption, based on experience and consultation with the PDT, as to the likely acquisition plan. The estimate should document this major assumption.

3.2.3 Format and Supporting Documentation. The cost engineer must plan the structure of all tasks of each estimate so that the data is logical and traceable. The overall structure of the cost estimate should be in accordance with the appropriate CWWBS as described in chapter 2. The cost engineer shall always remain mindful of the documentation necessary to support the cost estimate submission requirements specified for each phase of project development, such as reconnaissance, feasibility, and IGE (refer to chapter 2). Support documentation includes a project narrative, construction schedule, plan of construction, plan of work (subcontracting), backup data, and drawings and sketches. In the case of IGEs and negotiated procurements, the estimate structure may have to be reformulated to reflect the bid schedule or to support a likely negotiation.

3.2.4 Identify Types of Feature Level Costs. Various types of cost elements must be evaluated in detail.

3.2.4.1 Total construction cost is the sum of all direct costs plus applicable indirect costs to reflect the total construction cost.

3.2.4.2 Non-construction costs of all other feature levels within the CWWBS, such as Lands and Damages, Planning Engineering and Design, and Construction Management may be added to the construction costs to determine the TPC as required by program specific requirements.

3.2.5 Degree of Estimate Detail

3.2.5.1 Construction Tasks. All cost estimates within the scope of this ETL will be prepared based on calculated quantities and unit prices that are commensurate with the degree of detail of the design known or assumed. This is accomplished by separating construction into its incremental parts. These parts are commonly referred to as construction tasks and are the line-by-line listings of every estimate. Each task is then defined and priced as accurately as possible. Construction tasks are seldom spelled out in the contract documents but are necessary to define the construction requirements and develop the construction cost. It is highly recommended that critical

construction tasks reflect a standard unit price enabling historic and reasonable price comparisons.

3.2.5.2 Analyzing Construction Tasks. When analyzing construction tasks in an estimate, the cost engineer should identify the tasks that account for the major costs in the estimate. These tasks can be identified by applying the 80/20 rule (Pareto Principle), which states that approximately 80 percent of the project cost is contained in 20 percent of the tasks. Because these significant tasks account for most of the project cost, they should receive prime emphasis and effort in both preparation and review. This approach is generally applied in early budget estimates. As the scope evolves, a more detailed cost emphasis can then be placed on all project scope. The final estimate should capture all scope at a detailed level to support the independent estimate that is used for bidding purposes.

3.2.6 Most Detailed Estimate Level

3.2.6.1 At the most detailed level, each task is usually related to, and performed by a crew. The cost engineer develops or selects the task description by defining the type of effort or item to be constructed. Task descriptions should be as complete and accurate as possible to lend credibility to the estimate and aid in later review and analysis.

3.2.6.2 Whenever a significant amount of design assumptions are necessary, such as during the reconnaissance phase and in design-build process, the cost engineer should use historical cost data from previous similarly designed projects and/or use parametric estimating models.

3.2.6.3 Estimates should include notes that clarify the design, cost, crew, productivity, and unit price assumptions. It is important that the estimate demonstrate the basis of cost, the basic assumptions, and traceability for defense of the estimated costs.

3.3 Quantity Development.

3.3.1 The quantity “takeoff” is an important part of the cost estimate. It must be as accurate as possible and should be based on all available engineering and design data. Use of appropriate automation tools is highly recommended. Accuracy and completeness are critical factors in all cost estimates. An accurate and complete estimate establishes accountability and credibility of the cost engineer, therefore, providing greater confidence in the cost estimate. The estimate contingencies for programming purposes reflect the estimate confidence.

3.3.2 After the scope has been analyzed and broken down into construction tasks, each task must be quantified prior to pricing. Equal emphasis should be placed

on both accurate quantity calculation and accurate pricing. Quantities should be shown in standard units of measure and should be consistent with design units. Assistance for preparing “takeoffs” may be provided by others within the organization in support of cost engineering or by A-E contracts; however, the responsibility for the accuracy of the quantities remains with the cost engineer. Distinction should be made between “hard-line” or “net” quantities without waste versus quantities that include waste or loss. This is necessary to ensure duplication does not occur within the estimate.

3.3.3 The detail to which the quantities are prepared for each task is dependent on the level of design detail. Quantity calculations beyond design details are often necessary to determine a reasonable price to complete the overall scope of work for the cost estimate. A simple example would be fabrication waste material that is a material cost to the project. Project notes will be added at the appropriate level in the estimate to explain the basis for the quantity calculations, to clearly show assumed quantity allowances or quantity contingencies, and to record quantities determined by cost engineering judgment that will be reconciled upon design refinement. Use the following recommended guidelines in quantity development:

- Coordinate the quantity takeoff process and plan with the lead estimator.
- Ensure full project scope is reflected within the estimate.
- Include a list of materials in quantity takeoffs.
- Utilize a process that easily records the quantity development, i.e., document source and date, estimator name and date, location within the project, demonstrated calculations, separation of hard quantities, and additions such as waste or loss.
- Use a systematic approach similar to the construction methodology required.
- Check scales and dimensions on each drawing sheet; dimensions govern.
- Highlight or mark drawing areas where quantities have been determined to ensure all scope is captured but not double counted.
- Consider items that have no material but still require cost, e.g., job office overhead (JOOH), task setup, training and certifications, and labor preparation.
- Develop quantities within a reasonable range for the work using decimals where critical.
- Add a certain amount of waste, loss, drop off, or length related to the material purchases for a bulk order. Ensure this addition is separate from the original quantity measured.
- Select a natural stopping point during work interruptions.
- Provide a QC check of high cost and volume items.
- Coordinate with designers if the design appears in error, is unbiddable, if a better approach is discovered, or a value engineering process is warranted.

3.4 Construction Unit Costs. Whenever possible, the cost engineer should obtain multiple pricing sources. In pricing from any source, experience and ability to relate data in hand to a specific circumstance is important. The following paragraphs discuss commonly used pricing sources and price development.

3.4.1 Cost Book

3.4.1.1 The Cost Book is the common name for the Tri-Services Automated Cost Engineering Systems construction direct costs database (see appendix C and https://www.hnd.usace.army.mil/TRACES/). Another common term of the Cost Book as related to the MCACES supporting databases is the Unit Price Book (UPB). In generic terms, “cost book” refers to any cost-related commercial books that depict direct costs in the fashion of labor, equipment, material, crew, and productivity. For the purposes within this ETL, the Cost Book is considered synonymous with the UPB. The Cost Book is organized in accordance with the Construction Specification Institute numbering system. Some Cost Book line items may include quotes for work that is fully provided and installed by a subcontractor. Each office may use the Cost Book as well as refine the database by obtaining quotes to more accurately reflect local costs at the project site.

3.4.1.2 Commercial unit cost books are common sources typically available through subscription or purchase. Basis of costs shown are typically explained along with adjustment methodology. Such publications are valuable for verification and appropriate for commercial type work item pricing. Caution is advised, however, since the costs are averages that may not reflect special applications for specific project scopes.

3.4.2 Historical Data. Historical costs from past similar work are excellent pricing sources as long as two criteria are met: adequate details of the basis for the historical costs must be known, and the historical costs must be adjusted to account for project specifics. When these two criteria are met, portions of other estimates having similar work can be retrieved and repriced to the current project rates. Such repricing includes adjustments for project location, work methodology, quantity of work, and other dissimilarities, which affect prices. Additionally, historical costs must be escalated on a constant dollar basis to the current estimate effective price level. Cost engineering automated systems enable the collection and analysis of historical costs. Automated historical databases are discussed in appendix C.

3.4.3 Parametric Database. Parametric Cost Engineering System is a parametric database of predefined assemblies for buildings and site work (see appendix C). This is more commonly applied to military works; however, this can also be a useful tool in certain civil works estimates or portions of estimates.

3.4.4 Development of Unit Costs for Specific Tasks

3.4.4.1 When standard tasks from published price sources do not meet project needs, a unit cost for a specific task may need to be developed. Such development requires experience. Descriptions developed must adequately define the scope and requirement for each task. A unit cost for each task is developed as a direct cost (see chapter 4) with separate costing for labor, equipment, and material components, This is also true for certain unit prices related to the indirect costs (see chapter 5), usually found within the JOOHs. Notes, which explain key factors in the pricing, methodology, and assumptions, should accompany the task development. Comparison with existing pricing guides is recommended.

- Labor unit cost. This cost is based on a defined crew from the Cost Book or on a newly developed crew, which performs the tasks at an assigned production rate. Hourly wage rates for each craft are applied to the crew labor to arrive at the hourly crew labor cost. The total crew labor cost/hour is divided by the expected production rate (units/hour) to derive the labor cost per unit or "labor unit cost."
- Equipment unit cost. This cost is derived similar to labor unit cost. Hourly equipment rates are obtained from the appropriate regional pamphlet, Engineer Pamphlet (EP) 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule, or developed according to the methodology as described in that pamphlet.
- Material unit cost. This cost is developed using vendor quotes, historical costs, commercial pricing sources, or component calculations. The price should include delivery to the project site.

3.4.4.2 The unit cost for each developed specific task is the sum of the direct cost elements for labor, equipment, and materials resulting in the direct cost per unit.

3.5 Safeguarding Cost Estimates. Project cost estimates should be safeguarded and handled in a discretionary manner. The estimates may contain proprietary information. Access to each estimate and its contents will be limited to those persons whose duties require knowledge of the estimate. Estimates prepared by contract will also be similarly handled. Any request by the public for information and pricing in the estimate will not be provided until coordination, verification of data, and approvals have been given by the commander or the responsible cost engineer.

CHAPTER 4

Direct Cost Development

4.1 General. Direct costs are those costs that can be attributed to a single task of construction work that are applied to the prime contractor's cost. These costs are usually associated with a construction labor crew performing a task, using specific equipment and materials, or subcontracted efforts for the respective task. Subcontracted costs shall be considered as direct costs to the prime contractor in estimates. Subcontracted costs include the direct costs, which the subcontractor would perform, plus the indirect costs the subcontractor would incur such as subcontractor markups.

4.2 Crews. Direct labor cost requirements are broken into tasks of work. Since each task is usually performed by a labor crew including equipment, the crew must be defined, costed, and a production rate established for the task. Crews may vary in size and mix of skills. The number and size of each crew should be based on such considerations as having sufficient workers to perform a task within the construction schedule and the limitation of workspace. Once the crews have been developed, the task labor costs can be determined based on the production rate of the crew and the labor wage rates.

4.3 Labor. Direct labor costs are defined as base wages plus labor cost additives including payroll taxes, fringe benefits, travel, and overtime allowances paid by the contractor for personnel who perform a specific construction task. In addition to the actual workers, there are generally working crew foremen, who receive an hourly wage and are considered part of the direct labor costs. Certain trades may require travel or subsistence, depending upon trade availability and duration.

4.3.1 Wage Rates

4.3.1.1 A wage rate must be developed for each labor craft, which will represent the total hourly cost rate to the construction contractor. This total rate will include the base wage rate plus labor overtime, payroll taxes and insurance, fringe benefits, and travel or subsistence costs as further described in this chapter. The composite wage rate for each craft will be used for development of the estimate. The computation can be prepared similar to forms found in appendix E.

4.3.1.2 Wage rates are generally well defined. The Davis-Bacon Act, PL 74-403, requires a contractor performing construction in the United States for the Government to pay not less than the prevailing rates set by the Department of Labor. Information on prevailing rates can be found at http://www.wdol.gov/. A schedule of minimum rates is included in the project specifications and is normally kept on file for

each location by each local office of counsel. The cost engineer should consult with the contracting officer on any questions regarding determination coverage, specific definitions, or concerns. Where labor is in short supply for certain crafts in the area, the work is in a remote area, or it is well known that rates are higher than the set rate scale will be paid, these higher wage rates should be used instead of the minimum wage, since this would be required of the contractor in order to attract labor to the job. The wage rate should be adjusted to include travel time or night differential where these are a customary requirement.

4.3.1.3 For a long duration project, where future wage rates are known and used, care must be taken to avoid duplication by also applying an escalation rate to such costs.

4.3.2 Overtime and Shift Differential. The cost engineer should carefully consider the available working time in the construction schedule for each task accomplishment in a normal time period. The efficiency of both the second and third shifts should be adjusted to recognize that production will not be as high as the day shift for most types of construction operations. A three-shift operation should normally be avoided due to lower labor efficiency and the requirement to include equipment maintenance.

4.3.3 Overtime. Overtime should be included in the labor cost computation when work in excess of regular time is required by the construction schedule or is the custom of labor in the local vicinity. Overtime labor cost is normally calculated as a percentage of the base wage rate. It is usually based on time and one-half, but may be double time depending on the existing labor agreements. Tax and insurance costs are applied to overtime, but fringe benefits and travel and/or subsistence costs are not. Example 4-1 illustrates the overtime percentage calculation for 40 hours regular time, plus 8 hours overtime at time and one-half:

Example 4-1**:**

48 hours at straight time = 48.00 hours

8 hours at ½ time = 4.00 hours paid

Equivalent straight time = 52.00 hours

(52 hrs paid/48 hrs worked = 1.0833) -1 x 100%
= 8.33%

Note: See example estimate sheets in appendix E for method of application.

4.3.3.1 Shift Operations. Many construction projects utilize multiple shift operations. When estimating direct labor costs for multiple shift operations, the cost engineer should estimate the number of hours to be worked (include shift differential work loss) and the number of hours to be paid for each shift based upon the developed construction schedule. Differential shift premiums may need to be added to the hourly rate.

4.3.3.2 Tabulation of Overtime Percentages. A tabulation of overtime percentages for most conditions is shown in table 4-1. The percentage also includes an allowance for the direct work loss of multiple shift or shift differential, where applicable.

Table 4-1. Overtime and Shift Differential

				Percentages for Overtime and Shift Differential			
	Actual Hours Worked		Hours Paid		1.5x Week/Sat 2x	1.5x Week 2x	Week 2x
Shift	Day	Week	Regular	Overtime	Sun	Sat/Sun	All Overtime
One-shift operation							
5-Day Week	8	40	40	0	0	0	0
	9	45	40	5	**5.56**	**5.56**	11.11
	10	50	40	10	10.00	10.00	20.00
	11	55	40	15	13.64	13.64	27.27
	12	60	40	20	**16.67**	**16.67**	33.33
6-Day Week	8	48	40	8	8.33	16.67	16.67
	9	54	70	14	12.96	**21.30**	25.93
	10	60	40	20	16.67	25.00	33.33
	11	66	40	26	19.70	28.03	39.39
	12	72	40	32	22.22	30.56	44.44
7-Day Week	8	56	40	16	21.43	28.57	28.57
	9	63	40	23	25.40	32.54	36.51
	10	70	40	30	28.57	35.71	42.86
	11	77	40	37	31.17	38.31	48.05
	12	84	40	44	33.33	40.68	52.38
Two-Shift Operation (one 8 hours and one 7.5 hours)							
5-Day Week	15.5	77.5	80	0	3.23	3.23	3.23
	18	90	80	12.5	9.72	9.72	16.67
	20	100	80	22.5	13.75	13.75	25.00
	22	110	80	32.5	17.05	17.05	31.82
	24	120	80	42.5	19.79	19.79	37.50
6-Day Week	15.5	93	80	16	11.83	20.43	20.43
	18	108	80	31	17.13	25.69	31.48
	20	120	80	43	20.42	28.96	38.33
	22	132	80	55	23.11	31.63	43.94
	24	144	80	67	25.35	33.85	48.61

				Percentages for Overtime and Shift Differential			
	Actual Hours Worked		Hours Paid		1.5x Week/Sat 2x	1.5x Week 2x	Week 2x
Shift	Day	Week	Regular	Overtime	Sun	Sat/Sun	All Overtime
7-Day Week	15.5	108.5	80	32.0	25.35	32.72	32.72
	18	126	80	49.5	29.76	37.10	42.06
	20	140	80	63.5	32.50	39.82	47.86
	22	154	80	77.5	34.74	42.05	52.60
	24	168	80	91.5	36.61	43.90	56.55
Two-Shift Operation (each 7.5 hours)							
5-Day Week	15	75	80	0	6.67	6.67	6.67
	18	90	80	15	13.89	13.89	22.22
	20	100	80	25	17.50	17.50	30.00
	22	110	80	35	20.45	20.45	36.36
	24	120	80	45	22.92	22.92	41.67
6-Day Week	15	90	80	16	15.56	24.44	24.44
	18	108	80	34	21.30	30.09	37.04
	20	120	80	46	24.17	32.92	43.33
	22	132	80	58	26.52	35.23	48.48
	24	144	80	70	28.47	37.15	52.28
7-Day Week	15	105	80	32	29.52	37.14	37.14
	18	126	80	53	34.13	41.67	47.62
	20	140	80	67	**36.43**	43.93	52.86
	22	154	80	81	38.31	45.78	57.14
	24	168	80	95	39.88	**47.32**	60.71
Three-Shift Operation							
5-Day Week	22.5	112.5	120	0	6.67	6.67	6.67
6-Day Week	22.5	135.0	120	24	15.56	24.44	24.44
7-Day Week	22.5	157.5	120	48	29.52	37.14	37.14

4.3.4 Taxes and Insurance

4.3.4.1 Rates. Rates for all taxes and insurance applied to labor should be verified prior to computation. Insurances may include costs applied to longshoreman work near water, diving work, etc. Local unions can be a source of information for these peculiar insurance applications.

4.3.4.2 Workman's Compensation. Workman's compensation and employer's liability insurance costs applicable for the state in which the work is performed should be included in the composite wage rate. Insurance rates may be obtained from the state if the state law provides a monopoly or from insurance companies providing this type insurance. The project compensation rate is based on the classification of the major construction work and applies to all crafts employed by the contractor. Typically, the

actual rate that a contractor will pay is also adjusted annually based upon the company safety record and the number of claims submitted.

4.3.4.3 Unemployment Compensation Taxes. Unemployment compensation taxes are composed of both state and Federal taxes. Unemployment compensation tax will vary with each state while the Federal unemployment tax will be constant for all projects. Insurance rates can be obtained from the state unemployment office, commercial publications, or the Bureau of Labor Statistics.

4.3.4.4 Social Security Tax Rates. The social security tax rates and the income ceilings on which social security taxes must be paid vary from year to year. Therefore, the cost engineer must verify the rate to be used in the cost estimate. Current and future rates can be obtained from the Social Security Administration.

4.3.4.5 Total Percentage of Taxes and Insurance. The total percentage of the above taxes and insurance is summed and then applied to the basic hourly wage rate plus overtime for the various crafts. Example 4-2 illustrates the method for deriving the total tax and insurance percentage. Since rates are subject to change and in some cases vary by region, the calculations shown are presented as an example only. Actual values must be determined by the cost engineer for the specific project.

Example 4-2:

Workman's compensation and employer's liability

(varies with state and contractor) 7.60%

State unemployment compensation

(varies with each state) 3.20%

Federal unemployment compensation 0.80%

Social Security & Medicaid 7.65%

Total taxes and insurance 19.25%

Note: Foreman and overhead labor rates must also include these applicable costs. See example estimate sheets in appendix E for method of application.

4.3.5 Fringe Benefits and Travel/Subsistence

4.3.5.1 Fringe benefits may include health and welfare, pension, and apprentice training depending on the craft and the location of the work. These summed costs are usually expressed as an hourly cost with the possible exception of vacation, which may be easily converted to an hourly cost. The type of fringe and the amount for the various crafts can usually be found with the Davis-Bacon Act wage determination in the specifications. Non-union contractors pay comparable fringe benefits directly to their employees.

4.3.5.2 Example 4-3 illustrates the calculations for fringe benefits. Since the values change and vary by region and union agreement, the calculations shown are presented as an example only. Actual values must be determined by the cost engineer.

Example 4-3

Health and welfare $0.70/hr

Pension 0.75/hr

Apprentice training 0.00/hr

(N/A in this case)

Total fringe benefits $1.45/hr

4.3.5.3 Travel and subsistence costs are normally expressed as a daily or weekly cost. When included in the cost estimate, they should be converted to an hourly cost and excluded from an overtime premium unless travel and subsistence are part of an increased hourly wage. See example estimates in appendix E for methodology.

4.3.5.4 Some fringe benefits and travel/subsistence are subject to payroll taxes. For example, vacation benefits are taxable and should be added to the basic wage rate.

4.4 Labor Productivity.

4.4.1 General. Estimating labor productivity is subject to many diverse and unpredictable factors. There is no substitution for the knowledge and experience of the cost engineer when estimating labor productivity. For some types of work, the task productivity of crewmembers such as equipment operators, helpers, or oilers is determined by the productivity of the equipment. For some labor-based crews, the task productivity of craftsman, such as carpenters, steel workers, and masons, may be

based on average experience in the Cost Book, tempered with the experience of the cost engineer, historical records, or other appropriate reference manuals.

4.4.2 Productivity Adjustment Considerations

4.4.2.1 Labor Effort. The labor effort needed to perform a particular task varies with many factors, such as the relative experience, capability and morale of the workers, the size and complexity of the job, the climatic and topographic conditions, the degree of mechanization, the quality of job supervision, amount of similar task repetition, and the existing labor-management agreements and/or trade practices. The effort from these labor efficiency factors and work practices that exist in the project locality must be considered in each productivity assignment.

4.4.2.2 Civil works projects are normally heavy equipment oriented, and care should be used based on the tasks performed to ensure reasonable production rates are used. Operational requirements for pumping on dredges are unique and appropriate details are covered in appendix D for preparing dredge estimates.

4.4.2.3 Complexity of the Variable. The complexity of the variables affecting productivity makes it difficult to estimate a production rate. Therefore, production rates should be based on averaging past production rates for the same or similar work. The cost engineer must incorporate particular job factors and conditions to adjust historical data to the project being estimated. Other sources for production rates include reference manuals, field office reports, construction logbooks, and observation of ongoing construction.

4.4.2.4 Long Periods of Overtime. It is widely accepted that protracted overtime can result in lost productivity. The effect on worker productivity from long periods of overtime is shown in figure 4-1. Several tables and averaging charts have also been developed by private industry to show this effect. There are certain projects where multiple shifts are not possible due to environmental or public concerns. There are also certain large projects where overtime may be an advantage regarding schedule needs and the project appeals to industry for bidding competition. Many skilled trades prefer and seek projects promising overtime as a means of increasing their income. Relating to a specific project, the cost engineer should carefully consider other alternatives such as schedule duration change instead of overtime or multiple shift work and discuss the impact of these options with the PDT.

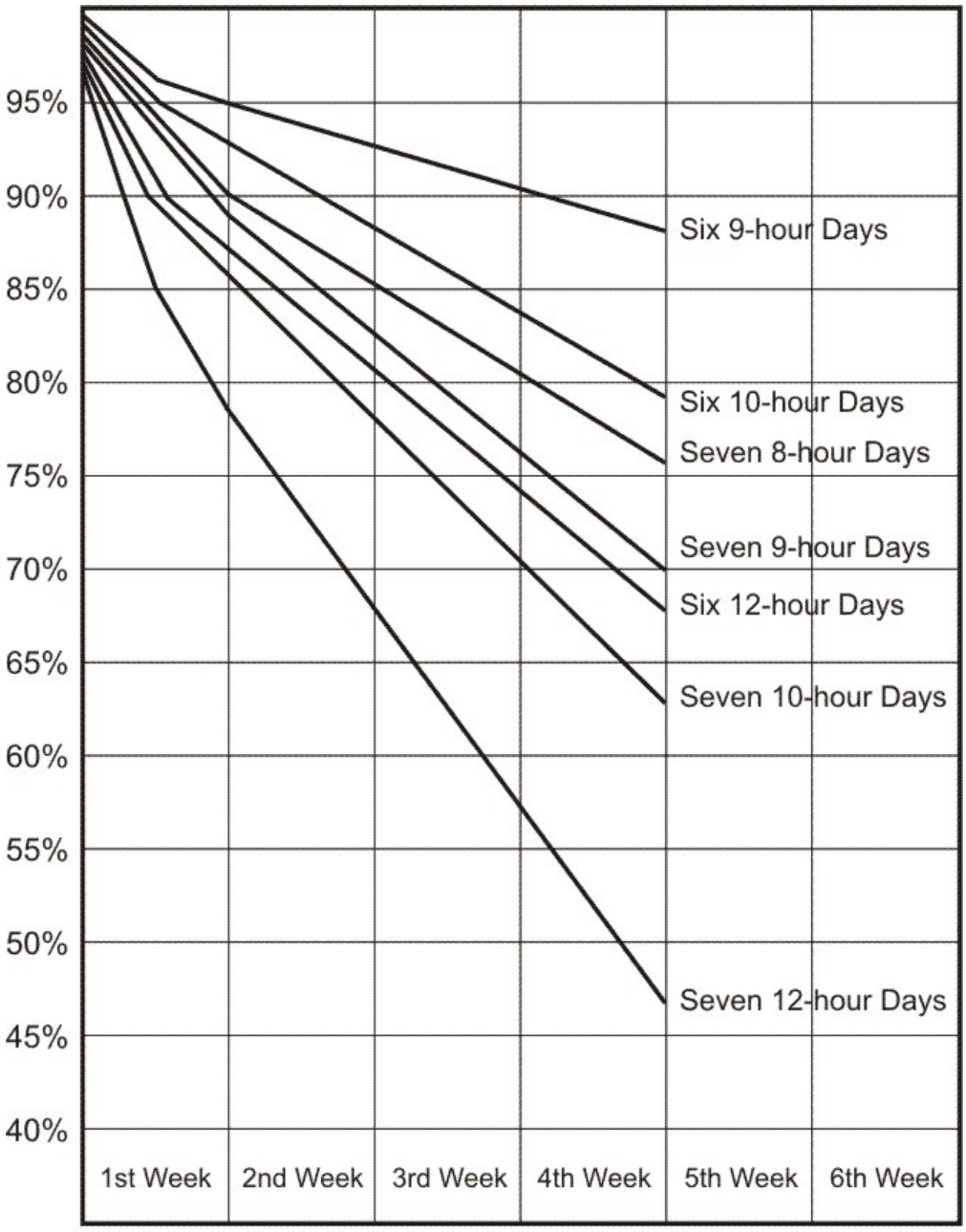


Figure 4-1. Effects on Worker Productivity from Long Periods of Overtime

4.5 Construction Equipment and Plant. Construction equipment and plant refers to the tools, instruments, machinery, and other mechanical implements required in the

performance of construction work. Construction plant is defined as concrete batch plants, aggregate processing plants, conveying systems, and any other processing plants, which are erected in place at the job site and are essentially stationary or fixed in place. Equipment is defined as items, which are portable or mobile, ranging from small hand tools through tractors, cranes, and trucks. For estimating purposes, plant and equipment are grouped together as equipment costs.

4.5.1 Selection of Equipment

4.5.1.1 An important consideration in the preparation of an estimate is the selection of the proper equipment to perform the required tasks. The cost engineer should carefully consider number, size, and function of equipment to arrive at optimum equipment usage. Some factors to consider during the selection process are:

- Conformance to specification requirements.
- Job progress schedule (production rate).
- Magnitude of the job; type of materials.
- Availability of space and site access.
- Mobility and availability of equipment.
- Suitability of equipment for other uses.
- Onsite batch or production plants.
- Equipment capabilities.
- Loading and unloading of freight.
- Number of shifts.
- Distances material must be moved.
- Steepness and direction of grades.
- Weather conditions.
- Hauling restrictions.
- Standby time.
- Mobilization and demobilization costs.

4.5.1.2 The cost engineer preparing the estimate must be familiar with construction equipment and job-site conditions. The equipment selected should conform to contract requirements and be suitable for the materials to be handled and conditions that will exist on the project. A good source of information to assist in earthwork equipment choices is Field Manual 5-434, Earthmoving Operations.

4.5.2 Equipment Productivity

4.5.2.1 The "crew concept" for project cost estimates requiring detailed estimating is to also be considered in costing equipment. For each significant work task, workers and equipment are expressed in the hourly cost and expected

production rate. Where a major piece of equipment serves more than one crew, the total equipment time should be prorated between both crews.

4.5.2.2 After determining the type of equipment to be employed, the cost engineer should select the specific equipment size that has a production rate suited to the efficient and economical performance of the work. The size and number of units required will be influenced by equipment production rate, job size, availability of space for equipment operations, the project construction schedule for the various work tasks, number of shifts to be worked, and the availability of equipment operators. Emphasis must be placed on the importance of establishing a reasonable production rate. Production may be based on actual performance data, commercial manufacturer tables, or rates from MCACES historical equipment models and assemblies, or adjusted for project conditions. A certain level of standby costs may be necessary if the equipment chosen is used on a part-time basis, remaining dormant without operator attendance for a significant period of the operation.

4.5.3 Mobilization and Demobilization

4.5.3.1 Mobilization costs for equipment include the cost of loading at the contractor's yard, transportation cost from the yard to the construction site, including permits, unloading at the site, necessary assembly and testing, and standby costs during mobilization and demobilization. Trucks for the project capable of highway movement are usually driven to the site and are often used to transport minor items. All labor, equipment, and supply costs required to mobilize the equipment should also be included in the mobilization cost. When the equipment location is unknown, the mobilization and demobilization distance should be based on a circular area around the project site, which will include a reasonable number of qualified bidders. Demobilization costs should be based on that portion of the equipment that would be expected to be returned to the contractor's storage yard and may be expressed as a percentage of mobilization costs. All labor, equipment, and supply costs required for cleaning/prepping the equipment so that it is in the same condition as it was when it arrived at the site should also be included in the demobilization cost. Transporting rates should be obtained periodically from qualified firms normally engaged in that type work.

4.5.3.2 Mobilization and demobilization costs for plant should be based on the delivered cost of the item, plus erection, taxes, and dismantling costs minus salvage value at the end of the project. Maintenance and repair are operating costs and should be distributed throughout work accomplishment.

4.5.4 Equipment Ownership and Operating Expense Cost Rates

4.5.4.1 The EP 1110-1-8 establishes the methodology for calculating hourly rates for equipment ownership and operating expense. Similar methodology and hourly rates can be found in the Cost Book and used in the preparation of cost estimates for

owned equipment. The EP 1110-1-8, volumes 1 through 12, has been developed for different geographic regions in the United States, and the appropriate volume or Cost Book should be used based upon project location. Rented and leased equipment is appropriate for inclusion in the estimate at competitive rates if judgment determines this to be a reasonable approach by a prudent contractor. The cost engineer may also use current commercially available publications for assistance in determining rates.

4.5.4.2 When the cost engineer develops costs for the actual equipment being used at a job site exceeding 40 hours per week, the rates shall be adjusted as described by EP 1110-1-8.

4.5.5 Plant Cost. In cases of highly specialized plant, 100 percent write off of the total value of the plant may be justified for a particular project. For less highly specialized plant, some salvage may be anticipated, depending on storage cost, resale value, and probability of sale or reuse in the immediate future. The total project charge including operation, maintenance, and repair should be distributed in proportion to the time and item the plant is used on the various contract items. Cost of plant required for the production of concrete, aggregates, ice or heat for cooling or heating of concrete, etc., should normally be included in the estimate as part of the cost of these materials or supplies manufactured or produced at the site.

4.5.6 Small Tools. The cost of small power and hand tools and miscellaneous non-capitalized equipment and supplies may be estimated as a percentage of the labor cost. The allowance must be determined by the cost engineer in each case, based upon experience for the type of work involved. The small tool cost will be considered as part of equipment cost. Such allowance can range typically up to 12 percent of direct labor cost. Another acceptable approach is to apply an actual small tools cost within the respective crew where it is applicable. The cost engineer must ensure that this cost is not duplicated in the overhead rate percentages. The crew's database in the Cost Book does not contain a small tools allowance.

4.6 Materials and Supplies. Materials and supplies are defined below and, for the purpose of estimating, both can be considered materials unless they need to be separated because of different tax rates. Materials are physically incorporated into and become part of the permanent structure. Supplies are items used in construction but do not become physically incorporated into the project such as concrete forms, welding rod, etc.

4.6.1 Sources of Pricing Data. Prices for materials and supplies may be obtained from pricing services, the Cost Book, commercial cost books, catalogs, quotations, and historical data records. Each office should review the source of the pricing contained in these publications and assess the reasonableness prior to use. Standard unit prices from these sources are considered satisfactory only after an

applicability determination has been made. Care should be taken when using this type of cost data to make proper allowances for quantity discounts, inflation, and other factors affecting contractor cost.

4.6.2 Waste Allowance. Waste and loss considerations may be included in material unit price computations. This methodology when computing material costs results in a quantity takeoff of work placement, which is not altered to reflect material losses. However, the alternative methodology of increasing the measured quantity by waste and loss quantity is acceptable if the excess quantity will not be used for any other purpose. If quantities are provided by others, it must be determined whether those quantities include waste or loss to avoid a double counting. The methodology used by the cost engineer should not include charging labor on the excess quantity. In either case, a note statement is required in the estimate explaining the methodology used.

4.6.3 Quotes from Manufacturers and Suppliers. Quotes should be obtained for all significant materials and installed equipment and for specialized or not readily available items. Quotations may be received either in writing or telephonically. It is preferable to obtain quotes for each project to ensure that the cost is current and that the item meets specifications. If possible, more than one quote should be obtained to be reasonably sure the prices are competitive. The cost engineer should attempt to determine and ensure that contractor discounts are considered in the estimate. The cost engineer should ascertain whether the quote includes delivery and sales tax. Quotes should be kept proprietary to preserve the confidentiality entrusted. A sample telephone quotation data sheet similar to that shown in appendix E, figure E-5, should be utilized for recording quoted information. The cost engineer should also take into consideration FAR Subpart 25.2, *Buy* American Act-Construction Materials, and FAR Subpart 6.1, Full and Open Competition, for the materials specified.

4.6.3.1 Forward Pricing. Sometimes quotes are requested in advance of the expected purchase date. However, suppliers are reluctant to guarantee future prices and often will only quote current prices. It may, therefore, be necessary to adjust current prices to reflect the cost expected at the actual purchase date. This cost adjustment, if required, must not be included as a contingency but should be clearly and separately defined in each estimate. Adjust current pricing to future pricing using escalation factors. This is applicable when there will be an extended construction period. Computations of adjustment should be clear and should be maintained as cost estimate backup support.

4.6.3.2 Freight. The cost engineer should check the basis for the price quotes to determine if they include delivery. If they do not include delivery, freight costs to the project site must be determined and included. The supplier can usually furnish an

approximate delivery cost. For delivery charge, Free on Board (FOB) refers to the point to which the seller will deliver goods without additional charge to the buyer.

- FOB Factory or Warehouse - if the materials or supplies are FOB factory or warehouse, freight costs to the construction site should be added to the cost of the materials or supplies.
- Unloading and Transporting Materials or Supplies - if the cost of materials or supplies includes partial delivery, FOB to the nearest rail station, the cost of unloading and transporting the materials or supplies should be included in the estimate.

4.6.4 Handling and Storage

4.6.4.1 If the materials or supplies are a large quantity in bulk that would require extensive equipment for unloading and hauling, it may be desirable to prepare a labor and equipment estimate for the material handling and delivery.

4.6.4.2 The contractor is usually required to offload, handle, and stockpile or warehouse materials on site. These costs should be included in the estimate. An item of electronic equipment requiring special low-humidity storage might have this special cost added to the direct cost of the equipment. For common items, such as construction materials or equipment needing secure storage, the cost for the security fencing, temporary building, and material handling should be considered as an indirect cost and be included in the job site overhead cost.

4.6.5 Taxes. When applicable, state and local sales tax should be added to the materials or supplies cost. In some states, material incorporated into Federal construction is exempt, but supplies are not. Care should be taken, therefore, that the sales tax rate is applied as required. The cost engineer should verify the tax rates and the applicability of these rates for the project location. Sales tax is considered a direct cost of the materials and supplies and should be applied to Government-furnished equipment and included in the estimate. In certain projects that are on the dividing line between states, such as roads, bridges, and dams, tax application may vary for the same material.

4.6.6 Materials or Supplies Manufactured or Produced at Site. If it is likely the contractor will manufacture or produce materials or supplies at the project site, a separate estimate component should be developed for this work. This estimate should be detailed and include all equipment, labor, materials, and supplies to produce the product and should conclude with a unit cost of material or supplies delivered to the stockpile, storage yard, or other end point.

4.6.7 Government-Furnished Materials or Equipment. On some projects, the Government may provide some of the project materials. Government-furnished

materials and equipment should be estimated in the same manner as other materials, except that the purchase price is not included. The estimate should include an allowance for transporting handling, storage from point of delivery and assembly, sales tax, and installation if applicable. There may be special costs associated with Government-furnished materials such as insurance to cover loss until final installation, special storage costs, or special security measures. Note that these materials and procurement costs are normally to be included as part of the TPC.

4.7 Subcontracted Work.

4.7.1 In construction, specialty items such as plumbing, heating, electrical, roofing, and architectural finishes are usually more effectively performed by subcontract. With so many specialties being performed, subcontract work becomes a very significant portion of the total costs of construction. Since each estimate should be prepared as practically and as realistically as possible, subcontract costs become a necessary consideration.

4.7.2 On major rehabilitation projects, such as dams, locks, or power generating facilities, the cost engineer must ensure that costs for mobilization and demobilization, access to site, tear down or demolition work, and contractor markup are included with the subcontractor costs or added to the prime contractor. This is particularly important for rebuilt or replacement of permanent equipment (e.g., turbines, generators, and navigation lock gates) for previously constructed projects where ancillary costs, in addition to the rebuilt costs, can be significant (e.g., exceed $1 million).

4.7.2.1 Parts of Work to be Subcontracted. The cost engineer must first determine those parts of the work that will probably be subcontracted. When the work to be subcontracted has been determined, those items will be identified in the estimate. The appropriate subcontractor overhead and profit costs should be applied to subcontractor direct cost items in addition to the appropriate prime contractor overhead and profit.

4.7.2.2 Cost of Subcontracted Work. The cost of subcontracted work is the total cost to the prime contractor for the work performed. Subcontractor's costs include direct labor, materials and supplies, equipment, second tier subcontracts, mobilization and demobilization, transportation, setup, and charges for overhead and profit. Particular attention should be given to large items such as turbines, generators, and incinerators. The total subcontract cost is considered a direct cost to the prime contractor.

4.7.2.3 Use of Quotations. While not the preferred method, the cost engineer may utilize quotes for the expected subcontracted work when reviewed and verified as reasonable. This is more acceptable if the subcontracted work is not considered a major task in the estimate and not intended for use as an IGE where the IGE

independence may be compromised Verification is normally established by obtaining several quotes or by developing a rough order estimate or by making comparison with historical or parametric data. In lieu of a quotation, each task of the subcontract should be priced as a direct cost with an appropriate rate of subcontractor's overhead and profit added.

CHAPTER 5

Indirect Costs

5.1 General. Indirect costs are those costs, which cannot be attributed to a single task of construction work. These costs include the prime contractor markups such as overhead, profit, bond, and certain taxes. Indirect costs are also referred to as distributed costs. The following discussions present the indirect costs in the order they are applied within the prime contractor markup structure. This is critical, because the values typically are compounded rates applied against the previous rates.

5.2 Overhead Costs.

5.2.1 Overhead costs are those costs that cannot be attributed to a single task of construction work. Costs, which can be applied to a particular item of work, should be considered a direct cost to that item and are not to be included in overhead costs.

5.2.2 For large civil works projects, the various tasks for overhead should be developed for each project rather than using flat overhead percentage rates. Flat rates may be used during the preliminary studies or when alternatives must be prepared if design is limited or not available.

5.2.3 The overhead costs are customarily divided into two categories:

5.2.3.1 JOOH also referred to as general conditions or field office overhead.

5.2.3.2 General home office overhead commonly referred to as general and administrative (G&A) costs or home office overhead (HOOH).

5.2.4 Duplication of Overhead Costs. The cost engineer must be sure that overhead costs are not duplicated between the two categories. Because of the nature of overhead costs, it is not practical to discuss all overhead items. Specific considerations must be carefully evaluated for each project. The cost engineer must use considerable care and judgment in estimating overhead costs. Many indirect cost items are frequently described in the General Requirements Section (Construction Specification Institute Division 01) of the contract specifications. If not related to a specific work task, these costs must be identified and appropriately assigned as overhead costs.

5.2.5 Previously Determined Overhead Rates. The application of a previously determined overhead rate for either category may be used for early project phases, but it is not an accurate or reliable method of forecasting costs. Overheads will vary from project to project and may even vary from month to month within any given project.

JOOH items for the prime contractor should be estimated in detail for all IGEs. Detailing of JOOH costs for subcontract work is recommended when the impact of these costs is significant.

5.2.6 Job Office Overhead. JOOH costs are those costs at the project site that occur specifically as a result of the particular project. In early estimate stages, a percentage near 5 percent is acceptable; however, from feasibility level forward, a detailed estimate should be developed. Table 5-1 provides general descriptions of typical costs encountered and appendix J is a template listing more detail; however, each project should be considered on its own merit.

Table 5-1. Job Office Overhead Costs

ADMINISTRATION JOB OFFICE
Includes all field administrating, accounting, purchasing, inventory, and security personnel and expenses. Also, consider subsistence and travel, offices, vehicles, supplies, and miscellaneous items to run the field office. Subsistence amounts may vary depending upon seniority and job classification.
WAREHOUSE AND MATERIALS HANDLING
Includes all field warehouses, stockyards, personnel, and equipment to handle, receive, unload, store, and transport materials around the project site. Also, consider subsistence and travel, vehicles, supplies, and miscellaneous cost items.
ENGINEERING AND SURVEYING
Includes all engineering, drafting, submittals, scheduling, surveying, and change order personnel. Also, consider subsistence and travel, vehicles, miscellaneous computer expenses, shop drawings, submittals and Critical Path Method schedules, operation and maintenance manuals, and miscellaneous cost items. **Note:** Personnel costs and supplies may cover submittal development and required contract document costs.
QUALITY CONTROL AND TESTING
Includes personnel, vehicles, equipment, and supplies to produce all QC reports, QC inspections, and all other contract quality requirements. Also, consider subsistence and travel, vehicles, supplies, and miscellaneous cost items. **Note:** Personnel costs and supplies may cover submittal development and required contract document costs.
SAFETY, TRAFFIC CONTROL, FIRST AID, AND FIRE
Includes all personnel, supplies, and vehicles needed for safety, traffic control, first aid, safety training, and fire prevention. Also, consider subsistence and travel, vehicles, supplies, and miscellaneous cost items. **Note:** Personnel costs and supplies may cover submittal and required contract document costs.

SANITATION FACILITIES AND TEMPORARY BUILDINGS
Includes all sanitation facilities miscellaneous, buildings, yards, and building costs not otherwise classified. This grouping does not include all project utilities costs.
GENERAL EQUIPMENT EXPENSES
Includes equipment not required by specific work items. Also, consider testing and rental of equipment when not charged to a specific bid item or items of work. Inspection fees and permits are included in mobilization and demobilization items.
PROJECT UTILITIES SITE AND CLEANUP
Includes all project costs not otherwise classified.
WINTERIZE PROJECT
Includes all items needed for a winter shutdown of the project or for construction activities during the winter months.
CAMP FACILITIES, WORKER SUBSISTENCE, AND TRAVEL
Includes costs to operate a camp to support construction workers. If no camp is furnished and subsistence is not included in the worker's hourly wage, show the number of subsistence days and daily cost. However, it is preferred to include subsistence with the hourly wage. Also, consider kitchens, camp vehicles, supplies, and miscellaneous items.
INSURANCE, INTEREST, PERMITS, AND FEES
Includes insurance costs, permits, and fees required by the contract. Business and occupation taxes, tribal taxes, and bid bond cost are not included in the JOOH but are included in other indirect cost markups.
MOBILIZATION AND PREPARATORY WORK (Optional)
Includes all items needed for the contractor mobilization and site preparatory work. Also, consider trucks, trailers, pilot cars, inspection fees, highway permits, loading, unloading, equipment standby and setup, and surveys. *USE ONLY if the project does NOT have a mobilization bid item.*
DEMOBILIZATION WORK (Optional)
Includes all items needed for contractor's demobilization from the project site and halfway to another project. Also, consider trucks, trailers, pilot cars, inspection fees, highway permits, loading, unloading, equipment standby, and take down. *USE ONLY if the project does NOT have a demobilization bid item.*
GOVERNMENT INSPECTION COSTS (In Alaska only)
Includes all items needed to keep Government Inspectors on site excluding salary.

5.2.7 General Home Office Overhead

5.2.7.1 G&A expenses are those incurred by the contractor in the overall management of business associated with all costs at the home office. These overhead expenses are not incurred for any one specific project and must be apportioned to all the contractor’s projects.

5.2.7.2 Many expenses such as interest and entertainment are not allowable. Construction equipment depreciation is included in the EP 1110-1-8 cost rates and should not be included in the G&A rate. An accurate percentage of G&A can only be determined by an audit. On major changes requiring an audit, it is important to request that the G&A rate be determined through the contracting officer.

5.2.7.3 Of all the categories of costs, the contractor's G&A costs are the least definable. Each contractor organizes his company differently from any other. Each incurs costs differently from varying sources and manages operations of that home office by their own methodology. There may be more than one home office employed. It is important to understand that home office costs are not standard and fixed. Even though the cost for a specific contractor varies from period to period, a rate is normally averaged as a computation of total home office costs over a sufficient period divided by the total volume of business during that specific period. This rate computation methodology allows distribution and projection to future project estimates. When more specific data is not available, the cost engineer may include empirical rates. Home office costs are typically included in the estimate of overhead as the product of an average experienced percentage rate times the expected contract amount. Typical categories of HOOH are:

- Main office building, furniture, equipment, etc.
- Fabrication shop and yard.
- Management and office staff salary and expense.
- Main office utilities.
- General communications and travel.
- Main office supplies.
- Corporate vehicles.
- General business insurance.
- Taxes.

5.2.8 Duration of Overhead Items. After the overhead items have been listed, a cost must be determined for each. Each item should be evaluated separately. Some items such as erection of the project office may occur only once in the project. The cost engineer should utilize the developed job schedule in estimating duration requirements. Costs reflective of each particular item during the scheduled period should then be applied. The product of duration and unit cost is the overhead cost for the item. In the

case of construction modifications, overhead should be re-addressed as related to the cost items and durations in the original contract.

5.2.9 Sources for Pricing. The cost engineer must rely on judgment, historical data, and current labor market conditions to establish overhead costs. Sources for information can be obtained from current or past contractor's bid data and audits. Other sources include previously negotiated modifications and review of organizational charts of construction firms for staffing and overhead costs evaluation. Overhead salaries should include an allowance for payroll taxes and fringes such as Federal Insurance Contributions Act, health benefits, and vacation.

5.2.10 Distribution of Overhead. The prime contractor's overhead costs, which have been costed in an organized format, should be summed and distributed to the various bid items. A proportionate distribution is commonly made by percentage ratio of total direct costs to those direct costs in each item. When additive, option, or split-bid items are included, only those overhead costs that relate directly to the additive work should be distributed to those additive items. Those overhead costs, which the contractor will incur regardless of additive or deductive items, should be distributed to base bid schedule items only. Selective distribution ensures recoupment of costs if only the basic contract scope is awarded. Regardless of the method of distribution, the estimates should clearly demonstrate the procedures and cost principles applied. As a refinement to distribution, the cost engineer may reasonably and justifiably reduce the prime overhead distribution on subcontract work items. The balance of the total prime overhead should then be distributed as discussed above to the remaining prime items of work. For modification estimates, overhead requirements should be itemized and costed to reflect the actual net change in cost of overhead, i.e., costs before and after the modification work.

5.3 Profit.

5.3.1 Profit is defined as a return on investment. It is what provides the contractor with an incentive to perform the work as efficiently as possible. The proper approach to use will depend on the type of contractual acquisition action and the supplemental regulations that apply to the type of contract activity. For example, A-E contracting profit is calculated differently than construction profit. Refer to FAR, Subpart 15.404-4, prescribing the use of a structured approach for determining the profit or fee objective for construction projects. Consultation may be in order with the contracting officer in regards to profit application for various procurement actions.

5.3.2 The DFAR, Subpart 215.404-4, prescribes three structured approaches for determining a profit or fee objective on any negotiated contract action (with exceptions); the weighted guidelines method, the modified weighted guidelines method, and an alternate structured approach. Generally ,the latter two are for contract actions

with nonprofit organizations and A-E respectively. Construction cost estimating shall use the weighted guideline method and is discussed further in this chapter.

5.3.3 Prime contractor profit is not included in civil works IGEs prepared for contract award. However, prime contractor profit is included in all estimates prepared for programming of funds for projects and for contract modifications. Profit may be included for projects funded by non-Federal users in work for others.

5.3.3.1 Weighted Guidelines Method. The weighted guidelines method yields a reasonable profit value and should be used to determine profit for all contracts that include profit. Since contract modifications are considered contracts, this rule still applies. This methodology should also be used wherever a detailed direct costing method is used for preparing construction estimates. A rate of profit may be used based on historical experience for reconnaissance or comparative estimates for alternative analysis during feasibility studies.

5.3.3.2 Weighted Guideline Factors. Based on the circumstances of each procurement action, each of the factors listed in table 5-2 will be weighted from 0.03 to 0.12 as discussed in the following text and provided in figure 5-1. Statements in sufficient detail to explain the reasons for assigning the specific weights shall be included on the profit computation sheet. The value will then be obtained by multiplying the rate column by the weight column. The value column when totaled indicates the fair and reasonable profit percentage.

- Degree of risk. Where the work involves no risk or the degree of risk is very small, the weighting should be 0.03; as the degree of risk increases, the weighting should be increased up to a maximum of 0.12. Lump sum items will have, generally, a higher weighted value than unit price items for which quantities are provided. Other things to consider include the nature of work; where the work is to be performed; the reasonableness of negotiated costs; the amount of labor included in the costs; and whether the negotiation occurs before or after the period of performance of work.
- Relative difficulty of work. If the work is difficult and complex, the weighting should be 0.12 and should be proportionately reduced to 0.03 on the simplest of jobs. This factor is tied in to some extent with the degree of risk. Some things to consider include technical nature of the work by whom work is to be done; location of work; and time schedule.
- Size of the job. Work not in excess of $100,000 will be weighted at 0.12. Work estimated between $100,000 and $5,000,000 will be proportionately weighted from 0.12 to 0.05. Work from $5,000,000 to $10,000,000 shall be weighted at 0.04 and work in excess of $10,000,000 at 0.03.
- Period of performance. Jobs in excess of 24 months are to be weighted at 0.12. Jobs of lesser duration are to be proportionately weighted to a minimum

of 0.03 for jobs not to exceed 30 days. No weight is given for modification estimates when additional performance time is not required.

- Contractor's investment. Jobs are to be weighted from 0.03 to 0.12 on the basis of below average, average to above average of contractor investment. Things to consider include amount of subcontracting; mobilization payment item; Government-furnished property; method of making progress payments; and front-end requirements of the job.
- Assistance by Government. Jobs are to be weighted from 0.12 to 0.03 on the basis of below average to above average. Things to consider include use of Government-owned property, equipment and facilities, and expediting assistance.
- Subcontracting. Jobs are to be weighted inversely proportional to the amount of subcontracting. Where 80 percent or more of the work is to be subcontracted, the weighting is to be 0.03 and such weighting proportionately increased to 0.12 where all work is performed by the contractor's own forces.

5.3.4 Separate Profit Calculation. A separate profit calculation should be performed for the prime contractor and for each subcontractor. When the subcontractor assumes the risk and responsibility for significant portions of the work, the prime contractor's profit rate on that work should be decreased. As a general rule, profit is applied as a percentage rate to the total of all costs required by the contract or modification scope. For early design stage estimates, a rate of profit may be assumed based on past experience.

Weighted Guidelines Profit Sheet

Project: Estimated By:

Contract No: Checked By:

Change Order No.: Date 9/14/05

Profit Objective For: (Prime Contractor, Subcontractor)

Factor	Rate (%)		Weight (0.03 - 0.12)		Value
1. Degree of Risk		x		=	
2. Difficulty of work		x		=	
3. Size of Job		x		=	
4. Period of Performance		x		=	
5. Contractor's Investment		x		=	
6. Assistance by Government		x		=	
7. Subcontracting		x		=	
	%		Profit Factor		%

COMMENTS (Reasons for Weights Assigned):

1.

2.

3.

4.

5.

6.

7.

Figure 5-1. Weighted Guidelines Profit Sheet

Table 5-2. Factors for Profit Determination

FACTOR 1	Degree of Risk (Judgmental)	
	Degree	Weight
	Small	0.03
	High	0.12

FACTOR 2	Relative Difficulty of Work (Judgmental)	
	Degree	Weight
	Difficult	0.12
	Simple	0.03

FACTOR 3	Size of Job					
Value (x 1000)			Weight	Value (x 1000)			Weight
$ 0	to	100	0.120	$ 2,701	to	2,800	0.081
101	to	200	0.119	2,801	to	2,900	0.080
201	to	300	0.117	2,901	to	3,000	0.079
301	to	400	0.116	3,001	to	3,100	0.077
401	to	500	0.114	3,101	to	3,200	0.076
501	to	600	0.113	3,201	to	3,300	0.074
601	to	700	0.111	3,301	to	3,400	0.073
701	to	800	0.110	3,401	to	3,500	0.071
801	to	900	0.109	3,501	to	3,600	0.070
901	to	1,000	0.107	3,601	to	3,700	0.069
1,001	to	1,100	0.106	3,701	to	3,800	0.067
1,101	to	1,200	0.104	3,801	to	3,900	0.066
1,201	to	1,300	0.103	3,901	to	4,000	0.064
1,301	to	1,400	0.101	4,001	to	4,100	0.063
1,401	to	1,500	0.100	4,101	to	4,200	0.061
1,501	to	1,600	0.099	4,201	to	4,300	0.060
1,601	to	1,700	0.097	4,301	to	4,400	0.059
1,701	to	1,800	0.096	4,401	to	4,500	0.057
1,801	to	1,900	0.094	4,501	to	4,600	0.056
1,901	to	2,000	0.093	4,601	to	4,700	0.054
2,001	to	2,100	0.091	4,701	to	4,800	0.053
2,101	to	2,200	0.090	4,801	to	4,900	0.051
2,201	to	2,300	0.089	4,901	to	5,000	0.050
2,301	to	2,400	0.087	5,001	to	10,000	0.040
2,401	to	2,500	0.086				
2,501	to	2,600	0.085	Over		10,000	0.030
2,601	to	2,700	0.084				

Table 5-2. Factors for Profit Determination (Cont.)

FACTOR 4	Period of Performance	Weight
	23 to 24 Months	0.120
	22 to 23 Months	0.116
	21 to 22 Months	0.112
	20 to 21 Months	0.109
	19 to 20 Months	0.105
	18 to 19 Months	0.101
	17 to 18 Months	0.098
	16 to 17 Months	0.094
	15 to 16 Months	0.090
	14 to 15 Months	0.086
	13 to 14 Months	0.082
	12 to 13 Months	0.079
	11 to 12 Months	0.075
	10 to 11 Months	0.071
	9 to 10 Months	0.068
	8 to 9 Months	0.064
	7 to 8 Months	0.060
	6 to 7 Months	0.056
	5 to 6 Months	0.052
	4 to 5 Months	0.049
	3 to 4 Months	0.045
	2 to 3 Months	0.041
	1 to 2 Months	0.038
	Under 30 Days	0.034
		0.030

FACTOR 5	Contractor's Investment (Judgmental)	
	Degree	Weight
	Below average	0.03
	Average	0.07
	Above average	0.12

FACTOR 6	Assistance by Government (Judgmental)	
	Degree	Weight
	Below average	0.12
	Average	0.07
	Above average	0.03

Table 5-2. Factors for Profit Determination (Cont.)

FACTOR 7	
Percent of Subcontracting	**Weight**
80% or more	0.030
70% to 80%	0.042
60% to 70%	0.055
50% to 60%	0.068
40% to 50%	0.080
30% to 40%	0.092
20% to 30%	0.105
10% to 20%	0.118
0	0.120

5.4 Surety Bonds. Surety bonds are three-way agreements between a bidder or contractor (the principal), and a second party (the surety), to assure fulfillment of the principal's obligations to a third party (the obligee). If the principal obligations are not met, the bond assures payment to the extent stipulated of any loss sustained by the obligee. In most Government construction contracts, the three parties are as follows:

Three Parties	Under General Contract	Under Subcontract
1. Principal	Contractor	Subcontractor
2. Obligee	Government	Contractor
3. Surety	Surety	Surety

5.4.1 Types of Bonds. The purpose of surety bonds varies with the type of bond:

5.4.1.1 Bid Bonds or Bid Guarantee. These types of bonds provide an assurance that the bidder will not withdraw his bid within the specified period for acceptance and will execute a written contract and furnish the required bonds if the bid is accepted.

5.4.1.2 Payment Bonds. A payment bond assures payments to all persons supplying labor or material of the work provided for in the contract. These type of bonds protect subcontractors, suppliers, and laborers against nonpayment by the prime contractor.

5.4.1.3 Performance Bonds. A performance bond ensures the contractor will complete the project as specified and for the agreed price. It does not shift responsibility for administering the contract to the surety. A performance bond provides a financial guarantee for the work and provides the contractor with a method of freeing his working capital and other assets, which might otherwise be tied up by other forms of surety such as certified checks, retainage, or deposits.

5.4.2 Surety Bond Requirements

5.4.2.1 The amount included in the estimate should be based on the contract requirements, the bond rules, premium rates, and, if known, the actual contractor bond cost. A bid guarantee is required on Federal projects whenever a performance bond and/or a payment bond is mandated. Performance and payment bonds are required for all construction contracts of $100,000 or more and some form of payment guarantee for lesser value contracts (FAR 28.102). For contracts under $100,000, Congress directed agencies to develop alternatives to surety bonds for contracts between $25,000 and $100,000. These statutory requirements are implemented in FAR part 28.

5.4.2.2 The cost of all performance bonds, payment bonds, and other types of bonds determined to be appropriate by the cost engineer are allowable costs.

5.4.3 Classes of Bonds. Bonds are classified as Class A, Class B, or Class A-1, depending on the type of construction to be performed. Most types of civil works projects are classified as Class B. Table 5-3 illustrates the various types and classes of bonds.

Table 5-3. Classes of Bonds

CLASS A (Contracts for furnishing and installing, or installing only, certain services or equipment)		
Airport runways	Greenhouses	Ski lifts
Aluminum siding	High-pressure power piping	Sprinkler systems
Athletic fields	Janitorial service	Stone (furnishing, delivering only)
Beacon or floodlights	Machinery made to special order	Storage tanks metal
Burial contracts	Map making	Tennis courts
Ceilings (metal or acoustical tile)	Millwork	Water carnage of freight
Certain walls (nonstructural)	Murals	Water proofing (except with gunite)
Coal storage	Parking areas	Wind tunnels
Ducts (underground power, light, phone)	Planting and cultivation of land	
Elevators/escalators	Playgrounds and parks	

Table 5-3. Classes of Bonds (Cont.)

CLASS B		
Airport buildings	Gas piping	Sand blasting
Aqueducts	Golf courses	Sculptures
Atomic energy plants	Grain elevators	Sea walls
Breakwaters	Gunite contracts	Sewage disposal plants
Canals and canal lining	Heating systems	Sewers/septic tanks
Carpentry	Hospital buildings	Shipyards
Coal stripping	Incinerators	Spillways
Commercial buildings	Industrial buildings and plants	Stone
Concrete work	Jetties	Subways
Dams	Landscaping	Swimming pools
Dikes	Locks	Terminals-buses
Ditches	Masonry	Test boring
Docks and drydocks	Missile installations	Tile and terrazzo
Drilling contracts	Nuclear reactors	Transmission or distribution lines
Educational buildings	Office buildings	Tunnels
Electrical	Offshore platforms	Underwater cables
Embankments	Painting	Ventilation systems
Excavations	Piers	Water works
Filling stations	Pilings	Wells
Filtering plans	Pipelines for water	Wharves
Fountains	Plastering	
Garbage disposal plants	Plumbing	
Gasoline cracking plants	Power plants	
Gas compressor stations	Public improvements	
Gas mains and laterals	Railroad roadbeds	
CLASS A-1 (Contracts for furnishing and installing, or installing only, certain services or equipment)		
Arms	Guardrails	Repair of automobiles and trucks
Ash conveyors	Heating	Re-smelting old metal
Automatic strokers	Incinerator operations	Riprap stone (furnishing only)
Automatic telephone exchange and equipment	Insulation contracts	Rolling stock
Automotive service contracts	Kitchen equipment	Scaffolding cost engineer should
Band concerts	Laboratory equipments	Sidewalks
Bird control	Leasing of motor vehicles	Signaling systems on railroads
Boiler re-tubing and repair	Lightning rods	Signs (all)
Bookbinding	Lock gates	Stack rooms
Cataloging	Mail handling machinery	Standpipes
Coal handling machinery	Metal windows and shutters	Street and subway lighting systems
Computers and data processing equipment	Mosquito control contracts	Temporary personnel services
Conveyors	Movies	Thermostat equipment
Data processing and computer works	Office personnel	Tollgates

Table 5-3. Classes of Bonds (Cont.)

Doors/dynamos	Organ repairs	Track laying
Exterminating contracts	Ornamental ironworks	Traffic control systems on highways
Fire alarm systems	Parking meters	Training manuals
Fire escapes	Photogrammetric work	Tree trimming and removal
Flagpoles	Pipelines for oil or gas	Watchmen and signal services
Floats	Police alarm systems	Water towers
Floors	Projectiles	Weather stripping
Furnishing food services	Public address and music systems	Weed mowing
Gas tanks	Radio towers	Window cleaning
Generators	Radiological equipment	Work and Labor
Grain doors, salvage, and disposal	Recapping automobile tires	X-Ray inspections

5.4.4 Determining Bond Rates. If the contract is susceptible to two classifications, normally the higher rate is applicable. Separate contracts take the same classification as a general contract. Neither the classification nor the rate is changed by subdividing the work or by the Government providing certain materials. Subcontracts use the same classifications and rates as general contracts. Bond rates may change and should be verified on an annual basis and verified for the specific locale. A good source for verification is construction branch, which commonly receives the bond rate calculations for specific projects.

5.4.4.1 Non-Deviating States Exceeding 12 months Stipulated Time. For states in conformance (non-deviating) with the Surety Association of America (SAA) rates (table 5-4) where the construction time exceeds the bond stipulated time of 12 months, add 1 percent of the bond premium for each month in excess of 12 months.

5.4.4.2 Deviating States Exceeding Stipulated Time. For states not conforming (deviating) with the SAA rates (table 5-5) where the construction time exceeds the bond stipulated time of 12 months, add one-half percent of the basic premium for each month in excess of 12 months up to 24 months and 1 percent of the basic premium for each month in excess of 24 months.

5.4.4.3 Non-Deviating States Exceeding 24 Months Stipulated Time. For states in conformance (non-deviating) with the SAA rates (table 5-6) where the construction time exceeds the bond stipulated time of 24 months, add 1 percent of the basic premium for each month in excess of 24 months.

5.4.5 Consent of Surety

5.4.5.1 Not required. If the consent of the surety is not required and given for changes or extras, first and renewal premiums for the additional cost thus caused are computed at manual rates from the date of the bond.

5.4.5.2 Required. If the consent of the surety is required and given for changes or extras, premium for the additional cost thus caused, is computed at manual rates from the date of such surety cost.

5.4.6 Cost of Performance and Payment Bonds. Performance and payment bonds are normally obtained as a single package. The premium is the same as for the performance bond alone. Rates vary with the type of the contract work, the dollar value, and the length of the contract.

5.4.6.1 Coverage Limit of Performance Bonds. The coverage limit of performance bonds is specified in each contract and is usually for the full amount of the contract price (bid amount). The premium is adjusted at the completion of the work for any modification changes in the contract price other than changes due to time bonuses or penalties. If the original contract price is increased through change order, the contractor must pay an additional premium. Conversely, if any part of the original work is deleted and the original price thereby reduced, the contractor will receive a refund from the surety.

5.4.6.2 SAA Issues Advisory Rates. It should be noted the surety industry has become a state-regulated industry. The SAA issues advisory rates, but these rates may or may not be accepted by the state involved. Therefore, actual rates charged by surety corporations may vary from state to state.

5.4.6.3 Calculation of Bond Premium Cost. The following example illustrates the calculation of bond premium cost. Since the rates are subject to change and may vary by state, the calculations are to be used as a sample only. The cost engineer is responsible for ensuring the rates used are accurate and current. This example assumes a canal excavation project in Tennessee to be accomplished at an estimated cost of $2.5 million, including profit, with a duration of 11 months. From table 5-3, “excavation” is found in Class B. Referring to the Class B rate schedule in table 5-4, the premium for a performance-payment bond written in the full amount of the contract price (including bond) and by a non-deviating Surety Association Company would be calculated as follows:

Example of Class B Bond Premium Calculation:

Estimated Bond	Amount	x	Rate =	Premium
First	$100,000	x	$25.00/M	$2,500
Next	$400,000	x	$15.00/M	$6,000
Next	$2,000,000	x	$10.00/M	$20,000
Anticipated Estimated Amount (inc. bond)	$2,500,000			$28,500

(20 mos. - 12 mos. = 8 mos. surcharge)

Eight additional months @ 1%/MONTH

(8 mo × 1% × $28,500)	$2,280
TOTAL PREMIUM	$30,780

Table 5-4. Performance and Payment Bond (completion time not over 12 months) with Non-Deviating Rates

Amount of Contract Price		Class B	Class A	Class A-1
First $	100,000	$25.00/M	$15.00/M	$9.40/M
Next	400,000	15.00	10.00	7.20
Next	2,000,000	10.00	7.00	6.00
Next	2,500,000	7.50	5.50	5.00
Next	2,500,000	7.50	5.00	4.50
Over	7,500,000	6.50	4.50	4.00

Note: SAA advisory rates per $1,000 of contract value for all jurisdictions except South Carolina, Louisiana, Delaware, Hawaii, and Arkansas.

Table 5-5. Performance and Payment Bond (completion time not to exceed 12 months) with Deviating Rates

Amount of Contract Price		Class B	Class A	Class A-1
First $	100,000	$10.00/M	$7.50/M	$4.90/M
Next	400,000	8.00	5.50	4.50
Next	2,000,000	7.00	5.00	4.10
Next	2,500,000	6.00	4.40	3.80
Next	2,500,000	5.00	3.80	3.50
Over	7,500,000	4.50	3.25	2.95

Note: Deviating rates from companies that may or may not belong to the SAA and are dependent on competition and contractor net worth. The rates per $1,000 of contract value are typical of a large contractor having a preferred rate structure.

Table 5-6. Performance and Payment Bond (not to exceed 24 months) with Non-Deviating Rates

Amount of Contract Price		Class B	Class A	Class A-1
First $	500,000	$14.40/M	$10.80/M	$7.20/M
Next	2,000,000	8.70	6.72	6.00
Next	2,500,000	6.90	5.28	4.92
Next	2,500,000	6.30	4.92	4.44
Over	7,500,000	5.76	4.44	3.96

Note: Non-deviating SAA advisory rates per $1,000 of contract value are for South Carolina, Louisiana, Delaware, Hawaii, and Arkansas.

5.5 Taxes. Indirect costs may include certain tax applications and are dependent upon the state wherein the project is located. The cost engineer should ensure those taxes are covered within the prime contractor markups, within the indirect costs. Examples include the business and occupation tax and the gross receipts tax. Consideration should be made when applying these rates when profit is not included within the estimate, since these rates are applied on total construction cost, including profit.

CHAPTER 6

Risk, Contingency, and Escalation

6.1 General. While the cost engineer is responsible for developing the construction cost and schedule estimates, the risk, contingency, and escalation must address all cost and schedule estimates of all features within the CWWBS. For this reason, it is recommended that the MCACES estimate includes all feature levels within the CWWBS. This chapter provides guidance regarding other costs not specifically identified in the previous chapter but costs that must be included in the preparation of TPC estimates for all feature level costs.

6.2 Risk Analysis.

6.2.1 A risk analysis is a formal process used to calculate or project the cost and schedule contingency at a selected confidence level for project execution success. The process must include the PDT since it addresses all perceived risks and benefits to TPC and schedule. The civil works risk analysis process is based upon the Monte Carlo methods related to probability of occurrence for the risk areas of concern, both positive and negative influences. HQUSACE mandates the use of the nationally recognized software Crystal Ball, an Excel-based Monte Carlo risk simulation software. Further guidance and procedures to conduct risk analysis is presented in appendix G.

6.2.2 A risk analysis should be provided on the TPC, including all features of the project, but excluding escalation and contingency. Too often, risk focuses on just the construction activities, which can result in critical risk elements remaining unidentified. Through early determination of potential project risks, management can then focus efforts in those areas for potential risk mitigation, resulting in cost and schedule savings. A formal risk analysis should be accomplished as a joint analysis between the cost engineer and the other PDT members that have specific knowledge and expertise on all possible project risks for all features, internal and external.

6.2.3 To accomplish this process, it is vital to first establish the method or process in risk identification. A recommended process is provided in the flow chart in figure 6-1. The current HQ guidance requires a formal analysis on all projects where the TPC exceeds $40 million. For projects where the TPC is less than the $40 million, a formal risk analysis is not mandatory, but may be prudent. Another accepted method for assessing risk and contingency for projects valued at less than $40 million is to evaluate on the merit of scope definition, quantity, and estimate confidence by feature, subfeature, major cost elements, and technical complexity.

6.2.4 Upon PDT formulation and instruction of the risk analysis process, the PDT addresses scope, identifying those areas that significantly contribute to cost and

schedule uncertainty. During this process, it is important that a risk facilitator lead the PDT risk discussions. It is also important that the cost engineer discuss the current estimate and schedule, the methodologies, and assumptions, because they will have bearing on the risk discussions and impacts. Figure 6-2 provides what is commonly referred to as a risk register. This sample is extremely helpful in guiding the PDT through the initial risk discussions. The outcome of those discussions is a preliminary risk register that indicates the perceived risks and the perceived impacts.

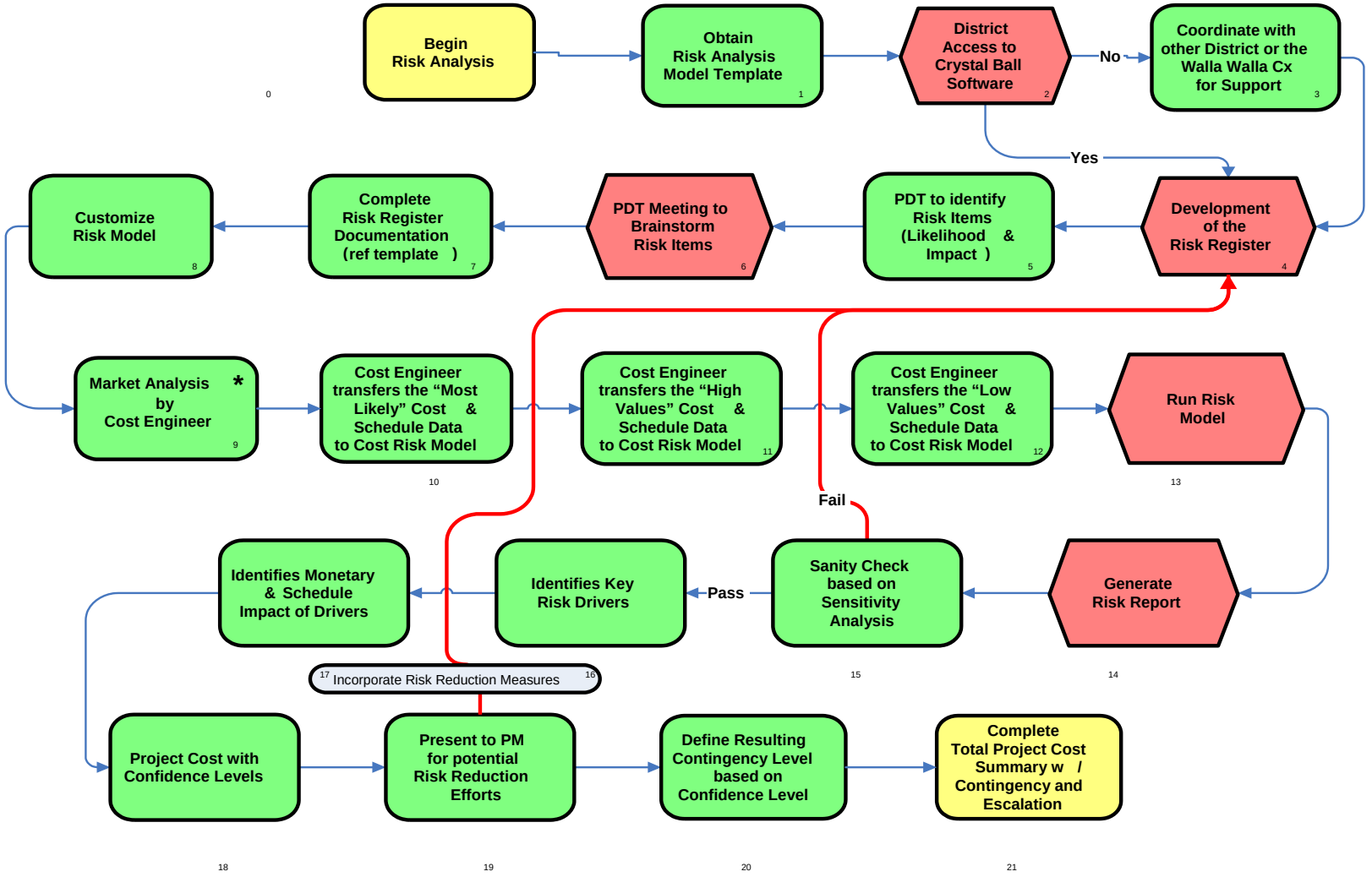
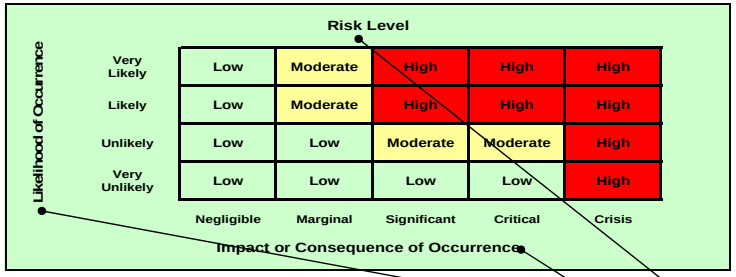


Figure 6-1. Recommended Risk Analysis Process



Risk No.	Risk/Opportunity Event	Discussion and Concerns	Project Cost				Project Schedule				Variance Distribution	Correlation to Other(s)	Responsibility/ POC	Affected Project Component	Project Implications
			Likelihood*	Impact*	Risk Level*	Rough Order Impact ($)	Likelihood*	Impact*	Risk Level*	Rough Order Impact (mo)					
Internal Risks (Internal Risk Items are those that are generated, caused, or controlled within the PDT's sphere of influence.)															
I-1	Scope Definition	Scope is fairly well defined for standard civil works features. The pumping plant requires considerable design and approximates 20% of the cost.	LIKELY	SIGNIFICANT	HIGH	$1,200,000	LIKELY	SIGNIFICANT	HIGH	8	UNIFORM	I-2	Project Manager/Planner	Construction Cost	Cost & Schedule
I-2	Scope Growth / Reduction	Scope is fairly well defined for standard civil works features. The pumping plant has potential of VE savings through better data and VE.	LIKELY	MARGINAL	MODERATE	($275,000)	LIKELY	MARGINAL	MODERATE	10	UNIFORM	I-1, I-16	Project Manager/Planner	Construction Cost	Cost & Schedule
I-3	Labor Availability/Pricing	$3 Billion construction will be occurring in locale over the next 5 years.	LIKELY	SIGNIFICANT	HIGH	$3,000,000	LIKELY	MARGINAL	MODERATE	9	TRIANGULAR		Project Manager/Planner	Labor/ Production Rates	Cost & Schedule
I-4	Equipment Availability/Pricing	Large cranes required, but available. Pump plant equipment long lead time.	UNLIKELY	NEGLIGIBLE	LOW	$900,000	UNLIKELY	MARGINAL	LOW	6	TRIANGULAR	I-15	Cost Engineering	Equipment/ Production Rates	
I-5	Material Availability/Pricing	Needed aggregates in short supply locally. This affects concrete, rip rap, base course and asphalt	VERY LIKELY	SIGNIFICANT	HIGH	$2,300,000	VERY LIKELY	MARGINAL	MODERATE	4	TRIANGULAR		Cost Engineering	Material Costs	Cost & Schedule
I-6	Fuel Prices	$2.65 per gallon was used in the Oct 06 MCACES, increases will effect equipment and delivery or materials	VERY LIKELY	SIGNIFICANT	HIGH	$1,750,000	VERY LIKELY	NEGLIGIBLE	LOW	0	TRIANGULAR		Cost Engineering	Equipment	Cost
I-7	Utility Relocations	Location is rural. However, several unmarked and abandoned farm related utilities are prevalent at this location.	LIKELY	MARGINAL	MODERATE	$870,000	LIKELY	MARGINAL	MODERATE	3	TRIANGULAR		Civil Design	Construction Cost	Cost & Schedule
I-8	Environmental Mitigation	Studies indicate that the area is heavily saturated with de-icing chemicals as well as agricultural fertilization and pesticide residuals.	LIKELY	SIGNIFICANT	HIGH	$1,600,000	LIKELY	SIGNIFICANT	HIGH	24	UNIFORM		Environmental Compliance Specialist	Construction Cost	Cost & Schedule
I-9	HTRW	A small portion of the project is located within the limits of an Army Chemical Depot undergoing BRAC.	UNLIKELY	MARGINAL	LOW	$400,000	UNLIKELY	SIGNIFICANT	MODERATE	18	UNIFORM		Environmental Compliance Specialist	Construction Cost	Schedule
I-10	Permits	Substantial permitting delays may occur if there are significant environmental mitigation/HTRW issues, or political opposition.	LIKELY	NEGLIGIBLE	LOW	$150,000	LIKELY	MARGINAL	MODERATE	17	TRIANGULAR	I-14, E-4	Planning/Regulatory	PED/Lands & Damages	Schedule
I-11	Environmental Windows	Project site is a natural habitat for various species of threatened wildlife that spawn during Spring months. No excavation is permitted from April 15 - June 30.	VERY LIKELY	SIGNIFICANT	HIGH	$3,500,000	VERY LIKELY	SIGNIFICANT	HIGH	30	TRIANGULAR	E-2	Project Manager/Planner	Construction Cost	Cost & Schedule
I-12	Sufficient Planning Schedule	Project is a fast-track project, although complicated. Concerns exist on obtaining appropriate schedule and funding for sufficient review and effort by specialized team members and contractors	LIKELY	MARGINAL	MODERATE	$300,000	LIKELY	SIGNIFICANT	HIGH	14	TRIANGULAR		Project Manager/Planner	Construction Cost	Cost & Schedule
I-13	Adequate Technical Staff	Due to fast-tracking, portions of design and planning effort are split between Gov't and AE specialists. Concern remains that the integration of staff may create delays.	LIKELY	NEGLIGIBLE	LOW	$200,000	LIKELY	MARGINAL	MODERATE	7	TRIANGULAR		Project Manager/Planner	PED	Schedule

I-14	Site Access	Site access is limited due to clearances required from U.S. Army installation, and local farmers remaining on property. Also, no excavation (or boring) is permitted April 15 - June 30.	VERY LIKELY	MARGINAL	MODERATE	$500,000	VERY LIKELY	NEGLIGIBLE	LOW	2	TRIANGULAR	I-10	Project Manager/Planner	Construction Cost	Cost
I-15	Special Equipment Fabrication	There are only two known manufacturers of the specialized filtration and pumping stations required on site, and neither are domestic.	UNLIKELY	NEGLIGIBLE	LOW	$1,900,000	UNLIKELY	NEGLIGIBLE	LOW	7	TRIANGULAR	I-4	Cost Engineering	Construction Cost	
I-16	Potential savings due to innovation, streamlining, and gains in efficiency	Value Engineering has already been incorporated into the project. VE remains on the pumping plant.	LIKELY	MARGINAL	MODERATE	($2,500,000)	LIKELY	NEGLIGIBLE	LOW	11	UNIFORM	I-2	Value Engineering Team	Productivity	Cost
I-17	Acquisition Plan	The estimate was based on full and open competition, with minimal tiering of contractor subs. The Acq Plan has not been finalized, therefore there is a potential for additional tiering of the contracts.	LIKELY	SIGNIFICANT	HIGH	$7,500,000	LIKELY	MARGINAL	MODERATE	16	TRIANGULAR	E-3	Acquisition Strategy Board	Construction Cost	Cost & Schedule
I-XX	Other Potentials														
	External Risks (External Risk Items are those that are generated, caused, or controlled exclusively outside the PDT's sphere of influence.)														
E-1	Weather	Work will be done on the river, unpredictable, scour protection is more vulnerable	LIKELY	NEGLIGIBLE	LOW	$175,000	LIKELY	MARGINAL	MODERATE	6	TRIANGULAR		N/A	Labor/ Production Rates	Schedule
E-2	Environmental Policy Changes	There are external environmental policy changes that can change the construction work windows.	LIKELY	SIGNIFICANT	HIGH	$1,400,000	LIKELY	SIGNIFICANT	HIGH	10	TRIANGULAR	I-11	Project Manager/Planner	Construction Cost	Cost & Schedule
E-3	Bidding Climate – Saturated Local Market	$3 Billion construction will be going on in downtown Pittsburgh over the next 5 years.	LIKELY	MARGINAL	MODERATE	$2,000,000	LIKELY	NEGLIGIBLE	LOW	4	UNIFORM	I-16	Acquisition Professional	Construction Cost	Cost
E-4	Political Support/Opposition	Project is highly visible and controversial. Delays due to political ramifications are possible and could critically delay or terminate the work.	LIKELY	SIGNIFICANT	HIGH	$6,400,000	LIKELY	SIGNIFICANT	HIGH	28	UNIFORM	I-10	Project Manager/Planner	Project Cost	Cost & Schedule
E-5	Sufficient Incremental Funding	Budget constraints could limit or delay funding, creating potential sequencing delays and issues, considering the environmental window constraints.	VERY LIKELY	SIGNIFICANT	HIGH	$4,600,000	VERY LIKELY	SIGNIFICANT	HIGH	27	TRIANGULAR		Project Manager/Planner	Project Cost	Cost & Schedule
E-XX	Other Potentials														

*Likelihood, Impact, and Risk Level to be verified through market research and analysis (conducted by cost engineer).

1. Risk/Opportunity identified with reference to the Risk Identification Checklist and through deliberation and study of the PDT.
2. Discussions and Concerns elaborates on Risk/Opportunity Events and includes any assumptions or findings (should contain information pertinent to eventual study and analysis of event's impact to project).
3. Likelihood is a measure of the probability of the event occurring -- **Very Unlikely**, **Unlikely**, **Moderately Likely**, **Likely**, **Very Likely.** The likelihood of the event will be the same for both Cost and Schedule, regardless of impact.
4. Impact is a measure of the event's effect on project objectives with relation to scope, cost, and/or schedule -- **Negligible**, **Marginal**, **Significant**, **Critical**, or **Crisis.** Impacts on Project Cost may vary in severity from impacts on Project Schedule.
5. Risk Level is the resultant of Likelihood and Impact **Low**, **Moderate**, or **High**. Refer to the matrix located at top of page.

A risk item for which the PDT has little data or probability of modeling with respect to effects on cost or schedule (i.e. "anyone's guess") would probably follow a uniform or discrete uniform distribution.

7. The responsibility or POC is the entity responsible as the Subject Matter Expert (SME) for action, monitoring, or information on the PDT for the identified risk or opportunity.
8. Correlation recognizes those risk events that may be related to one another. Care should be given to ensure the risks are handled correctly without a "double counting."
9. Affected Project Component identifies the specific item of the project to which the risk directly or strongly correlates.
10. Project Implications identifies whether or not the risk item affects project cost, project schedule, or both. The PDT is responsible for conducting studies for both Project Cost and for Project Schedule.
11. Results of the risk identification process are studied and further developed by the Cost Engineer, then analyzed through the Monte Carlo Analysis Method for Cost (Contingency) and Schedule (Escalation) Growth.

Figure 6-2. Sample Risk Register

6.2.4.1 Following the Pareto Principle, 80 percent of the cost of a project is contained in 20 percent of the estimated work elements. The object is to focus on the uncertainty associated with the so-called 20 percent “critical” elements. Variables such as internal project and external project influences should be considered. Internal variables that carry differing degrees of confidence that can significantly impact cost and schedule might be items such as real estate, mitigation, scope definition, quantities, productivity, labor, specific materials or equipment, location, and access. Scope has been identified as the largest impact to cost and schedule growth. Examples of external influences might be contract acquisition strategy and bidding climate, bid competition, assurance of project funding, weather, etc.

6.2.4.2 Upon determination of what items are considered potential risks, the cost engineer then completes the most likely cost estimate, which becomes the base cost represented within the TPCS before application of contingency and escalation. The cost engineer then studies the market to determine whether the perceived risks are real and significant to the successful execution of the project.

6.2.4.3 Upon completion of the market studies, conclusions can then be made related to the significance of the risks. The cost engineer then completes the risk register(s), addressing both cost and schedule impacts. The cost engineer evaluates the most likely estimate and related risk parameters, determining the best or most optimistic potential, the most likely potential, and the worst-case potential. Caution should be exercised to ensure the best case and worst case are not taken to an extreme, because those extremes can skew the risk potential.

6.2.4.4 Upon completion and understanding of the impacts for the significant items, the cost engineer is then ready to prepare the data for a software application and analysis. It is recommended that the risk be captured and reported at the 80 percent confidence level. Quite often, the first software application will result in contingency value that does not seem credible. The cost engineer should re-evaluate and question the risk potentials, studying possible duplication, item correlations, or unreal best or worst-case items. There are occurrences where the entire PDT must meet again to discuss the results, but often, the cost engineer can resolve concerns by working with key individuals of the PDT.

6.2.4.5 A high contingency can mean several things. It can reflect lack of clear scope. It may mean that the “most likely” estimate is actually low or too optimistic. It can also imply a flawed risk analysis. Conversely, if a low contingency result is obtained where scope is still poorly defined, further risk study is in order.

6.2.4.6 A cost and schedule risk analysis will identify the contingency that must be added to a project to cover cost and schedule growth potential. It should be noted that the use of risk analysis will not reduce the uncertainties associated with the project

cost estimate or solve the problems of cost variance due to insufficient investigations or design data. This process more readily identifies elements of the project where additional design or study effort may reduce the uncertainties and provide a more reliable cost estimate.

6.3 Contingency.

6.3.1 Contingency is to cover unknowns, unforeseen uncertainties, and/or unanticipated conditions that are not possible to adequately evaluate or determine from the data on hand at the time the cost estimate is prepared. Contingencies relate to the uncertainties of the current known and defined project scope and are not a prediction of future project scope or schedule changes.

6.3.2 The goal in contingency development is to determine a confidence value by means of a percentage in potential cost and schedule growth. The contingency value reflects the level or degree of project development. Typically, the less defined a project, the higher the contingency value. Scope definition and estimate quality have a significant bearing on confidence, risks, and resulting contingency development. The more defined a scope and the better developed the estimate will result in a lower contingency. Consideration must be given to the details available at each stage of planning, design, or construction for which a cost estimate is being prepared.

6.3.3 For a preliminary estimate at feasibility level, the contingency may be a result of a formal risk analysis. When performing the analysis, the estimate should not contain a contingency, because the risk analysis is developing that amount. Upon completion of the estimate, sufficient contingencies should be considered at the lowest MCACES title or detail level where the risks or uncertainties have been identified. Contingencies may vary throughout the cost estimate and could have a significant impact on overall costs being high when the lack of investigation data or design detail is associated with critical/high cost elements. The cost estimate narrative should discuss the reasons for the applied estimate contingency rate and assignment.

6.3.4 Forward pricing in an estimate to adjust current prices to reflect the cost expected at the actual purchase date, e.g., long construction period, should not be included as a contingency, but should be clearly and separately defined in each estimate. Labor wage increases throughout long construction periods shall be included and clearly documented in the estimate and not considered contingency.

6.3.5 Contingency allocations are specifically related to the project uncertainties and should not be reduced without appropriate supporting justification. The decision to reduce these uncertainties and improve the cost estimate through additional investigations or studies, or to proceed with the higher cost estimate, is a management decision.

6.4 Cost Escalation.

6.4.1 Civil Works Construction Cost Index System (CWCCIS), Engineer Manual (EM) 1110-2-1304, provides historical and forecasted cost indexes for use in price indexing and escalation to account for inflation. The indexes presented in the manual are specifically designed for civil works construction, and are specific for each of the major civil works features. Only indexes for construction costs have been developed. The indexes are also used to escalate or inflate various project cost features to current or future price levels respectively.

6.4.2 Each cost engineer providing support to planning studies must be familiar with cost estimates prepared on a constant dollar basis (escalation) and an inflated dollar basis (inflation) described in the Planning Guidance Notebook (ER 1105-2-100). Reporting civil works project costs and guidance for preparing the TPCS sheet (presented in appendix B).

6.4.3 Construction cost estimates, when finalized, must reflect the total estimated cost during the entire duration of construction. Cost escalation due to inflation must be identified as a separate element within the cost estimate. This allows the cost engineer the ability to easily adjust the estimate to reflect construction schedule changes.

6.4.4 For projects with construction cost estimates more than two years old without an update in pricing, special consideration is required. In these situations, it is the responsibility of the cost engineer to perform an appropriate analysis to ensure that the construction estimate is based on the current design and schedule. The construction cost estimates for major or unique and Congress-approved projects will be updated and re-priced using current labor and material rates.

6.4.5 For projects with construction estimates less than two years old, it is acceptable to use the CWCCIS cost indexes to update the construction estimate and other project cost elements. This decision should be based on the judgment and experience of the cost engineer.

6.4.6 Schedule Development for Total Project Schedule

6.4.6.1 The project schedule is used to forecast when project tasks or activities will begin, the duration of each task, and its relationship to other tasks. Knowing how each task or activity is funded will illustrate when the costs are expected to occur and when the funding is needed. When referring to CWCCIS and the TPCS, it becomes very apparent that escalation is dependent upon the project schedule. In order to confidently compute the escalation that is reflected within the TPCS, a project schedule must be developed that represents all feature levels, engineering, and design as well as construction efforts. The cost engineer is responsible to develop the schedule for the

construction elements and tasks. There are several software programs available to accomplish this.

6.4.6.2 It is recommended that, as a minimum, schedule development includes the main tasks or activities; the main cost and schedule drivers that can affect duration. While the cost engineer may choose to resource load the schedule for both cost and time, the minimum schedule should reflect the logic and construction flow of critical and near critical path elements and durations. Those durations should reflect the estimate task productivities. Often times, the schedule will indicate logic flaws within the estimate related to critical and near-critical tasks, concurrent activities, sequential activities, work windows and restrictions, need for crew adjustments, and/or overtime. The schedule may result in a need to change the estimate logic. This is critical, because the objective is to estimate an escalation value commensurate with the project requirements and restrictions.

6.4.7 Price Level/Escalation Adjustment

6.4.7.1 All cost estimate elements will be priced to a common calendar date base (month and year). This date is referred to as the effective price level date. Once the cost estimate has been prepared to the effective price level date, the estimate may require cost adjustment to accommodate economic analyses, budgeting and financial analyses, the construction schedule, or the project schedule. Therefore, the cost engineer should calculate escalation as separately identifiable elements, and the calculation methodology should be clearly defined and indicated. See CWCCIS, EM 1110-2-1304, for specific guidance and the TPCS found in appendix B.

6.4.7.2 As the project scope progresses to a feasibility level and as indicated in ER 1110-2-1150, project schedules are required to support escalation calculations as well as planning project management activities. The project schedules are extremely helpful in considering the estimate logic related to critical path, near critical path, and concurrent activities as well as potential need for overtime, multiple crews, and shifts to perform the work.

CHAPTER 7

Independent Government Estimates

7.1 General.

7.1.1 The IGE for construction is the formal, approved cost estimate prepared and submitted to support contract award. This estimate is required for all contracts of $100,000 or more (FAR 36.203). The IGE is used to determine the reasonableness of competitive bids or proposals received in connection with formally advertised construction contracts, regardless of the acquisition strategy or contract type. The IGE typically consists of a Government Estimate of Contract Cost, Details and Analysis of Construction Contract Costs, and Support to the Estimate. Each part is shown in figure 7-1. Sample Government estimate sheets are illustrated in appendix E. Security and control of the Government estimate is described in paragraph 7.7.4.1.

7.1.2 The IGE normally consists of a title page, signature page, and price or bid schedule. Supporting documents that are publicly available as parts of the solicitation (such as plans, specifications, and project descriptions) are not part of the IGE. The IGE shall be approved, dated, and signed by the District Commander or approved designee.

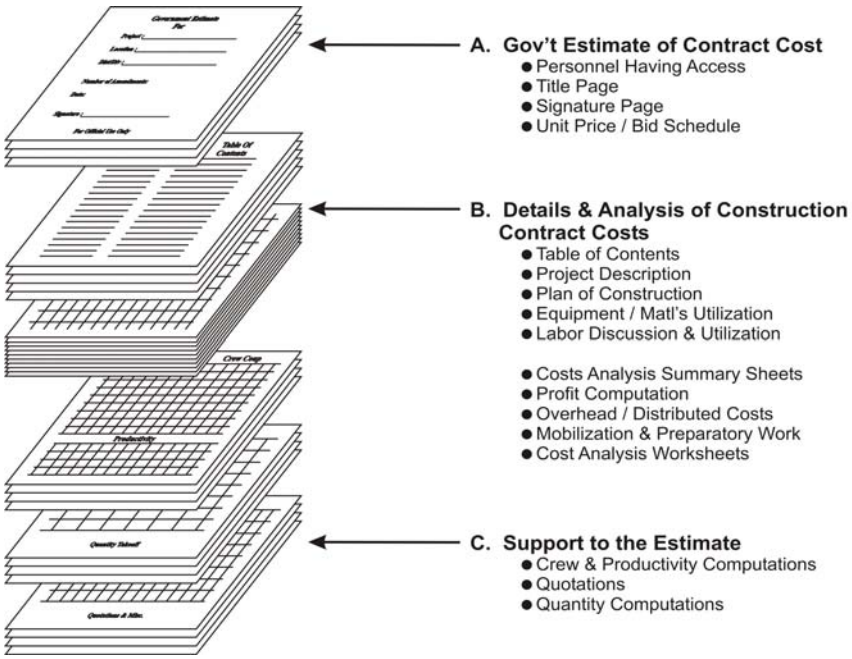


Figure 7-1. Example Composition of an Independent Government Estimate

7.2 Contract Cost. The IGE is the portion of the cost estimate to be submitted as required by procurement regulations. It includes the title page, signature page, and bid/price schedule.

7.2.1 Title Page. The title page should include the name and location of the project, the office responsible for the project design, the cost engineer responsible for preparation of the cost estimate, and the date and price level of the cost estimate.

7.2.2 Signature Page. The signature page should contain the names and signatures of those individuals responsible for the preparation, review, submittal, and approval of the cost estimate. It is necessary that the sheet contain the total amount of the estimated costs. The number of amendments included in the estimate should appear on the same page so that there will be no question as to the approved amount.

7.2.3 Pricing Schedule. The bid/price schedule required by the solicitation documents must be completed as part of the IGE. As part of the design team, the cost engineer should be involved in the development of the bid/price schedule. The format of the bid/price schedule must be anticipated in planning and design estimates. When the bid/price schedule is finalized for procurement, it must show unit prices, quantities, extension of unit prices, lump sum items, and total costs. Rounding off is not permitted on the bid/price schedule between the unit price and extension. Any rounding adjustments must be performed in the bid schedule. Instructions found within the contract solicitation bid documents also pertain to the IGE.

7.3 Details and Analysis of Construction Contract Costs. This part of the estimate of construction cost consists primarily of those sheets with notes, which describe the scope tasks and costing. It also contains discussions, considerations, and developed construction plan. The types of items normally included are as follows:

7.3.1 Table of Contents. The table of contents should reflect the estimate structure and CWWBS. For IGEs, the table of contents should reflect the bid schedule at the highest level, estimate structure at the lower levels, reflecting the CWWBS.

7.3.2 Project Narrative. The project narrative provides general details of the project scope and supporting cost databases. The narrative shall present discussion of the major construction features and elements. The narrative shall also define the critical assumptions and basis of costs that were made during the preparation of the cost estimate. It describes the project requirements and construction methodology that must be performed in sufficient detail to give a clear understanding of the scope of work. It also describes project details including length, width, height and shape of primary features, special problems that will be encountered in performing the work, site conditions affecting the work, reasons for selection of major plant and equipment, method and time for mobilization and demobilization of all equipment, and the reasons for unusually high or low unit prices. Each estimate will include a statement, which

relates both the development of design, as appropriate, and date of effective pricing. Other factors to be considered in the project narrative include:

7.3.2.1 Construction schedule, use of overtime, construction windows, phasing, acquisition plan, and subcontracting.

7.3.2.2 Project related details including site access; borrow areas; construction methodology; unusual conditions (soil, water, or weather); unique techniques of construction; equipment/labor availability and distance traveled; environmental concerns; and effective dates and sources for labor, equipment, and material pricing.

7.3.3 Construction Schedule

7.3.3.1 The cost engineer may prepare a construction schedule to support the cost estimate that is consistent with the schedule for completion of the project. It may be in the form of a bar chart or network analysis system. It must identify the sequence and duration of the tasks upon which the cost estimate is developed. The schedule must be prepared in sufficient detail to adequately develop the required labor, equipment, crew sizes, and production rates required for each of the identified construction tasks.

7.3.3.2 Schedules are helpful in determining estimate logic, sequencing, phasing, and concurrent activities as well as critical path elements. The schedule should be compared to the contract schedule requirements when determining which portions of the work may require overtime and/or multiple work crews and crew sizes.

7.3.4 Equipment and Materials Utilization. On those projects involving considerable heavy construction equipment, it is necessary to sufficiently plan the equipment usage against the work schedule to identify the actual number of cranes, dozers, etc., and allow for proper mobilization to assure that demand for the equipment is not over- or understated. For equipment selected from EP 1110-1-8, indicate the region and date of the equipment schedule used for pricing the equipment. Materials, which require long lead time and can become critical to the construction schedule, should be noted, planned, and adequately considered. Certain heavy equipment choices must consider load and size restrictions on structures such as dams, highways, bridges, overhead obstructions, etc.

7.3.5 Labor Discussion and Utilization. The estimate should clearly state the sources for the various labor classifications and rates and include tabulation by crafts of the various composite wage rates used. When extensive overtime beyond the normal workday is used in the estimate, an explanation should be included.

7.4 Support to the Estimate.

7.4.1 This part of the estimate consists of all the support and backup documentation. The various categories of support documentation contained in this part include:

7.4.1.1 Cost Analysis Summary Sheets. The automated or manually prepared summary sheets for direct, indirect, and owner costs are used to summarize cost components for each bid item and by the appropriate CWWBS. Distribution of overhead and profit is shown on this sheet.

7.4.1.2 Mobilization, Preparatory Work, and Demobilization. These costs should be itemized and costed separately. These costs may be combined at the summary level with overhead if these costs are not paid as a separate bid item. This item may be shown as a lump sum on the bid schedule.

7.4.1.3 Profit Computation Sheet. Profit is not to be included in any construction IGE for work to be performed by private contract (33 United States Code 624) so that the 25 percent fair and reasonable award measure can be made in accordance with PL 95-269. This applies to any basic contract for construction, as well as task orders since they are considered separate contracts. Should profit be requested by the contracting officer for negotiation purposes, the weighted guideline (paragraph 5.3.3.1) profit calculation method will be used to compute the profit and will be part of the cost estimate backup, but it shall not be included within the 25 percent award comparison.

7.4.1.4 Overhead Costs. The itemization and calculations of overhead costs, both job site and home office, should be accomplished in accordance with chapter 5.

7.4.1.5 Bond Costs. Bond costs should be calculated in accordance with paragraph 5.4. Distribution is made to bid items similar to or as part of overhead costs distribution.

7.4.1.6 Automated Detail Sheets. The completed direct costs should be organized in the proper sequence by the appropriate CWWBS for each bid item.

7.4.1.7 Production Rates. The automated or manually prepared details are used to express production rate analysis of crews. See chapter 4 for further discussion.

7.4.1.8 Crew, Labor, and Equipment Rates. These automated or manually prepared details are used to express the crew composition and associated rates for labor and equipment costs. The information contained on these sheets provides the backup support for the task unit labor and equipment costs shown.

7.4.1.9 Quantity Computations. The quantity takeoff computations for the tasks estimated should be organized by task for the bid items and kept as backup. The takeoff should reference the drawing and clearly explain the computation.

7.4.1.10 Quotations. Quotations should be collected and compiled by task or bid item into an organized reference. When quotations were not obtained for significant material and supply items, the basis for the cost used should be fully described. Quotations should be considered proprietary information and should be kept confidential to protect the information entrusted to the cost engineer. Quotations should consider whether markups and delivery have been included.

7.5 Miscellaneous Support Data.

7.5.1 Include all other information pertinent to the estimate such as drawings and sketches, which were used as the basis of the cost estimate. Drawings may include a project map showing the location of the work with respect to principal cities, roads, railways, and waterways. A site map may show the location of the work, borrow, quarry, spoil areas, and existing work access roads. Any existing facilities usable by the contractor should be included as well as a general plan and elevation or profile of the work with typical sections and a construction layout.

7.5.2 Supporting documents that are publicly available as parts of the solicitation, such as plans, specifications, and project description, or that contain no cost information, such as sketches, soil boring, and material classifications, are not part of the IGE or Government estimate backup.

7.6 Estimate and Schedule Quality Review.

7.6.1 Before IGE approval and submission by cost engineering, the cost engineer shall ensure an adequate DQC review (chapter 9) has been provided, and the estimate adjusted accordingly.

7.7 Revision to Independent Government Estimate. Prior to award, the IGE may be changed or revised as a result of errors, omissions, or additional information. Approval authority for revision to the estimate remains the original estimate-approving official. Each office shall assure that appropriate justification is attached to the revised cost estimate. Estimates may be revised by supplementary sheets or by actually changing the contents of the original estimate pages. The method used will be determined by the nature of the revision and the format of the estimate. Whichever the method, all revisions to the estimate must be clearly indicated, dated, justified, and approved. A new signature sheet relating both the previously approved total and revised total will be reapproved. A copy of each estimate that has been approved should be included in a file along with the details and circumstances reflecting the revisions.

7.7.1 Access to Independent Government Estimates. Access to the IGE and its contents will be limited to personnel whose duties require knowledge of the subject. When an A-E is contracted to prepare an estimate, the A-E submittal should include a list of personnel that have had access to the total estimate amount. It is recommended that all personnel sign a confidentiality agreement. Government cost engineers preparing or reviewing the final IGE may also sign the same or a similar list. A list similar to figure E-1 (appendix E) may be filed with the IGE.

7.7.2 Marking the Records “For Official Use Only.” The marking of records at the time of their creation provides notice of FOUO content and facilitates review when a record is requested under the Freedom of Information Act (FOIA). The responsible cost engineer will ensure that the FOUO marking is applied in accordance with Army Regulation 25-55, The Department of the Army Freedom of Information Act, to all pertinent documents, computer files, compact discs, printouts, and other documents prepared manually or electronically for incorporation into the IGE.

7.7.3 Disclosure of Records

7.7.3.1 The IGE and Government estimate backup data, prepared for construction contracts, are sensitive procurement information and should in many cases be withheld under FOIA. Ordinarily, after contract award, only the title page, signature page, and price schedule are disclosed outside the Government. The Government estimate backup data should not be released since it contains sensitive, detailed cost data (e.g., contractor quotes, crews, and productivity) that are proprietary or might compromise claim litigation and cost estimates for future similar procurement.

7.7.3.2 Fair market price determinations, under the Small Business Program, FAR 19.202.6, will be treated as IGEs for purposes of this guidance.

7.7.3.3 Supporting documents that are publicly available as part of the solicitation, such as plans, specifications and project description, or documents that do

not contain cost information, such as sketches, soil borings and material classifications, are not part of the IGE or Government estimate backup.

7.7.4 Bid Protests and Litigation

7.7.4.1 During bid protests and litigation, if appropriate and to the extent possible, USACE Office of Counsel should have the IGE and/or the Government estimate backup data placed under a “protective order.” At that time, security of the IGE becomes even more critical and any cost information and release should go through the Office of Counsel. There are valid reasons for not releasing the Government backup data supporting the IGE to the contractors and can be considered one of the exemptions under the FOIA. In the case of a bid protest, there is a possibility that the contract could be re-advertised or converted to a negotiated procurement. Release of the Government backup data would provide bidders with the detailed cost data that supports the IGE. If, however, the apparent low bidder protests the reasonableness of the IGE, the USACE command may choose to provide the IGE and Government estimate backup data, to the protestor only, upon receipt of complete details of the protestor’s estimate.

7.7.4.2 For this potential, it is imperative that the estimate be well developed and defensible with adequate information to support the basis of the estimate through discussion and notes supporting estimate assumptions and methodology.

7.7.5 Release Under Freedom of Information Act. IGE and Government estimate backup data are intra-agency memoranda, which may be withheld under FOIA Exemption 5, “confidential commercial information” and “deliberative process” privileges. Proper use of Exemption 5, however, requires a showing that release of information will harm the Government’s interests. Therefore, requests for the IGE and Government estimate backup data will be reviewed on a case-by-case basis, based on the following guidance, to determine whether release will harm the interests of the Government.

7.7.5.1 In reviewing requests, the FOIA officer will seek the assistance of the cost engineer. If the FOIA officer determines that release will harm the interests of the Government, the information will be withheld.

7.7.5.2 When sealed bidding is used, neither the IGE nor the Government estimate backup data should be released prior to bid opening. See FAR 36-203(c), 36.204. It is well established that release of IGE and Government estimate backup data before contract award would harm the interests of the Government. The FAR and legal reference is FAR 36.203, Federal Open Market Committee v. Merrill, 443 U.S. 340 (1979), Morrison-Knudson v. Department of the Army, 595 F. Supp. 352 (D.D.C. 1984), aff’d 762 F.2d 138 (D.C. Cir 1985).

7.7.5.3 The IGE will normally be released when bids are opened. In some instances, however, the IGE will not be released at that time, such as when all bids received are non-responsive and a re-procurement is envisioned.

7.7.5.4 In negotiated procurement for construction under FAR Parts 15 and 36, the IGE should not be released prior to contract award, except that Government negotiators may disclose portions of the IGE in negotiating a fair and reasonable price, see FAR 36-203(c).

7.7.5.5 The Government estimate backup data should not be released. Release of Government estimate backup data after contract award and before completion of a construction contract may also result in harm to the Government. The Government estimate backup data is used to develop cost estimates for modifications and claims. Release of the backup data prior to contract completion provides the contractor with the details of the Government's position and would allow the contractor to develop a biased price proposal or support a claim. This could harm the Government's ability to negotiate a fair and reasonable price for the modification or claim, putting the Government at a serious commercial disadvantage. Moreover, knowledge of the construction methods contemplated by the Government might reduce the contractor's incentive to discover less expensive methods. This could also reduce the contractor's incentive to locate and charge out materials at a lower cost, or to achieve project goals using less labor and equipment. See Quarles v. Department of the Navy, 983 F.2d 390, (D.C. Cir 1990) and Taylor Woodrow International, Ltd. V. Department of the Navy, No. 88-429R, (W.D. Wash. Apr. 6, 1989).

7.7.5.6 Generally, after contract completion (and after all claims have been resolved), the Government estimate backup data may be released. Situations where the information should not be released include frequently recurring contracts and multiple-phased projects where a series of similar contracts are awarded in sequence. In those cases, each IGE is based upon the same backup data and the same analysis of how to perform the work.

CHAPTER 8

Independent Government Estimates for Contract Modifications

8.1 General. The cost engineering office is currently not responsible to prepare construction modification estimates, but may do so upon request from the construction office. The district cost engineer has several important tasks to perform prior to actually preparing the estimate. The cost engineer will review the contract modification package to thoroughly understand the scope of changes, dispute, or other issues related to cost and time impacts. A contract modification and its estimate must address both cost and time, since both will be negotiated. Some of the major activities to be considered in preparing the estimate in addition to labor, material, equipment, and construction techniques include the following discussions.

8.2 Reviewing Documents. The cost engineer will review documents received and become thoroughly familiar with the scope and requirements of the changed work. The review should entail comparison, analysis, and discussions with the designer or field office to ensure common understanding of the scope of work. The cost engineer must assure that the proposed modification is clearly defined with regard to specified work requirements, proposed measurement, and payment.

8.3 Determine Status of Construction. The cost engineer will determine the status of construction and the effect the changed work will have on the construction schedule. This will require obtaining progress reports, schedules, and discussions with the field office responsible for the construction. For major or complex changes, a visit to the construction site is required.

8.4 Contractor's Existing Methods. The cost engineer should be fully aware of the contractor's existing methods, capabilities, and rates of accomplishment. The estimate should not arbitrarily include methods and capabilities different from the method in which the contractor is performing the ongoing work. The cost engineer should base the change on existing contractor operations for similar work. When work is anticipated to be subcontracted, the estimate should be prepared to include subcontractor costs.

8.5 Current Labor and Equipment Rates. Current labor and equipment rates for the workforce must be obtained for ongoing work. These rates are usually available from labor reports or from the contractor upon request. Suppliers for materials should be contacted for quotes. The price, which the contractor is expected to pay, should be the basis for estimating material costs. A list of equipment on the job should be obtained and equipment rates determined in accordance with EP 1110-1-8.

8.6 Scope of Work Coordination. The cost engineer should become familiar with the scope of work through the contracting officer’s designated representative and with the

contractor prior to preparation of the IGE. This discussion will assist both the Government and contractor in reaching a mutually acceptable scope of work to eliminate unnecessary effort for both parties during negotiations. After initial scope discussions, the scope of work documents may require revision for accuracy and clarity to support estimates and negotiations.

8.7 Preparation of Cost Estimates and Negotiation. The estimate can be prepared after all the information has been collected and analyzed, and the cost engineer decides upon the format to present the change. The format should distinguish between added work and deleted contract work. The estimate should denote both cost and time impacts. It is important to have a prior agreement and discussion as previously indicated with the contractor. Generally, successful negotiations depend on agreement in scope of work and accurate quantity takeoff and a detailed estimate supported by accurate cost data for all elements.

8.7.1 Additional Work. For additional work, items and format should be priced similar to a new contract as performed by the known contractor. All new work should be priced at the rates anticipated to be in effect at the time the work will be performed.

8.7.2 Changed Work. For changed work, a separate quantity takeoff for each item directly affected will be required for both before and after the change. Each item should be priced at the rates that would be in effect at the scheduled time of accomplishment. Typically, each item of changed original work is priced, and each comparable item of revised work is priced at the applicable rates. The net cost (or credit) would be obtained by subtracting the total of the original work from the total of the revised work. It is important that the cost engineer maintains a comparable scope of work for both estimates. When an item of work will be performed as originally specified, except for a revision in quantity, the net quantity may be estimated directly for that item.

8.7.3 Deleted Work. For deleted work, the item and format should be priced similar to a new procurement as performed by the current contractor. Rates in effect at the time the work would have occurred should be utilized. In addition to the direct cost of the work, overhead, profit, and bond costs should be included for credit on the deleted work.

8.7.4 Impact Related Costs. Often times, a modification can affect other portions of the contract that are not easily discernable when reviewing the modification scope. Impacts related to cost and schedule, if applicable, should be clearly described and included as part of each cost estimate. Remobilization, schedules, efficiencies, and productivities are prime examples of impact related costs. Further discussion is in paragraph 8.11.

8.8 Detail of Estimate. The cost estimate for a modification should be prepared in as much detail as required to clearly cost the change for negotiations. In many instances,

even more detail is required to negotiate the lowest reasonable price. The estimate should, however, be modified to reflect a negotiated procurement in lieu of an advertised procurement. It should include a general summary sheet relating the major categories of cost of the modification, both for increases and decreases. Revised construction drawings and specifications are included in the modification supporting documents. When the cost engineer prepares the estimate, the effort should be the same as the contractor acting prudently under the given conditions. The results will generally provide an accurate estimate, which can be used as a firm basis for negotiation. The IGE should not rely on past generalized rates and settlements unless actually appropriate to the specific modification under consideration.

8.9 Basis of Estimate. The estimate should be based on the data actually collected and experienced from the project. Time motion studies are important, and periodic field visits and log records can provide this data. Previous modifications can also provide valuable data. Valuable cost data is often available from past audit reports on other modifications. With the assistance of the auditor, many costs can be readily obtained and may be directly applicable to the present modification. The cost engineer must exercise judgment in the use of audit information from a specific report that may not be released to Government personnel or other contractors.

8.10 Estimate Preparation. In addition to the preparation of an accurate cost estimate, it must be prepared in a timely manner. Procurement requirements stress the importance of settlement prior to commencing the work. As construction time progresses, the Government is at greater risk for further contractor impacts which can increase cost and time. Therefore, the cost engineer should immediately proceed to obtain the necessary data for the modification and notify the appropriate authorities of the earliest date that the estimate can be completed. It is generally understood that the larger and more complex the change, the longer the time requirement for the initial preparation of an accurate cost estimate.

8.11 Impact Cost and Schedule.

8.11.1 When a modification is initiated, the settlement of that modification includes not only the cost and time change of the work directly affected but also the cost and time impact on the unchanged work. It is very important to accurately estimate the impact portion of a modification. The scope of impact may be broad and susceptible to a large variety of situations. The following discussion will provide guidance and understanding of impact cost considerations.

8.11.2 Generally, the greatest portion of impact costs results from acceleration and/or delays due to changes. When delays due to a change can be minimized, impact costs are reduced. Impact costs are normally determined on a case-by-case basis for each particular situation. The determinations have been based on interpretation of the

Contract General Provision Clauses and on Board of Contract Appeals and court decisions.

8.11.3 The contractor generally presents impact costs as part of the proposal. The existing construction schedule furnished by the contractor must be analyzed to determine the actual construction and the extent of the impact at the time of the change. The modification work must be superimposed upon the original schedule in such a position to determine and minimize the delay. The revised plan must then be thoroughly reviewed relative to the existing job plan. This comparative review should indicate those areas, which have been affected by the modification.

8.11.4 Once the extent of impact has been determined, each cost claimed must be classified as either factual or judgmental. The factual costs are those which are fixed and established and can be determined directly from records. These include rental agreements, wage rate agreements, and purchase orders. Once the item has been determined valid as a factual impact, the item cost may be directly calculated. The amount of cost change is stated on the certified document or can be determined from the scheduled time change of the construction progress plan. Judgmental costs are dependent on variable factors such as performance, efficiency, or methodology and cannot be stated factually prior to actual accomplishment. These costs must be negotiated and based upon experienced judgments. In actual practice, most factual costs are based to varying degrees upon judgment.

8.11.5 Estimating Impact Costs and Schedules. The estimate of impact should be prepared for each activity affecting the change. In some cases, the impact items are typically so interrelated that it is often best to develop a detailed plan for accomplishing the remaining work. Each item in this plan would be estimated at the productivity and rate in effect at the time the work is to be accomplished. The same items of work under the original plan would also be estimated at the productivity and rate in effect at the originally scheduled time. The comparison of these two estimates yields the cost of impact. Impact costs determined to be valid must be estimated by the most accurate method available and included in the modification.

8.11.6 Impact Factors. The following impact factors or conditions play a recurring role in determining impact costs and schedules. Each modification must be evaluated separately and impacts considered specifically for the implications of the particular change. Impacts should only be included by detailed itemization and only after having been found to be valid.

8.11.6.1 Impact costs considered factual include escalation of material and labor wage rates, and change in equipment rates.

8.11.6.2 Impact costs and schedules considered judgmental include change of efficiency resulting from rescheduling; loss of labor efficiency resulting from long hours;

loss of efficiency caused by disruption of the orderly existing processes and procedures; inefficiency from tearing out completed work and the associated lowering of morale; loss of efficiency during rescheduling of manpower; inefficiency incurred from re-submittal of shop drawings, sample materials, etc.; and additional costs resulting from inability to transfer manpower expertise to other work; and change in management for the revised work.

8.11.6.3 Impact costs and schedules considered factual but based on judgmental decisions include increase from extending the storage period for materials and equipment; increase from extending the contract for labor cost and subsistence; increase from a longer period of equipment rentals and/or use; increase from a longer period of using overhead personnel, materials, and utilities; and increase from a longer period of providing overhead and project office services.

8.12 Cost Engineering Support.

8.12.1 Before participating as part of a negotiating team, the cost engineer must become thoroughly familiar with negotiating requirements and techniques. The expertise and support of the cost engineer can be very beneficial in major and complex changes.

8.12.2 The cost engineer should review the contractor's proposal. Many of the costs that are presented in the contractor's proposal breakdown must be reviewed for allowability. Of those costs found allowable, each item must further be reviewed for applicability for that portion relevant to the particular change. The auditor has primary responsibility for this determination and should advise the negotiation team accordingly. For those cases where the auditor is not directly involved, the negotiation team must base their decisions on regulatory guidance and the best expertise available. In accomplishing the review of the proposal, the cost engineer should remain constantly aware of the contractor's profit motivation. The Government must consider all reasonable costs anticipated to be incurred by the contractor.

8.13 Estimate Revisions. Revision of the IGE may be necessary as a result of an error, changed conditions, or additional information. Approval authority for revisions to the estimate remains the responsibility of the contracting officer or authorized original estimate-approving official. When the IGE is changed during or subsequent to conferences or negotiations, the details of the basis for the revision or changes in price shall be fully explained and documented in the price negotiation memorandum. A copy of each estimate that has been approved should be included in the official modification file along with the details and circumstances causing the revisions.

CHAPTER 9

Technical Reviews

9.1 General. To improve the quality of the cost estimates, there are various levels of review as discussed within this chapter. Certain reviews are mandatory and are directed by headquarters (refer to ER 1110-2-1150 and ER 1110-2-1302). The reviews cover the products from “top to bottom” to ensure quality and confidence has been maintained.

9.2 District Quality Control Review.

9.2.1 The DQC review (also known as a peer review) is an internal peer review by a technical element within a district as a quality control measure. It consists of a formal procedure or set of procedures intended to ensure that the developed product adheres to a defined set of quality criteria or meets the requirements of the client, customer, and regulations. A DQC is similar to, but not identical with, QA. QA is often times defined as a procedure or set of procedures intended to ensure that a product or service under development (before work is complete, as opposed to afterwards) meets specified requirements. QA is sometimes expressed together with QC as a single expression, QC/QA. A sample quality review checklist is provided in appendix F.

9.2.2 Within the estimate processes, the cost engineering office is required to prepare the products in accordance to the regulations, most specifically to ER 1110-2-1150 and ER 1110-2-1302 for each phase of the estimate. The cost engineering office shall provide a formal review process performed by a senior lead estimator to ensure the products meet cost estimating requirements. In these cases, it may relate to various design phases with respect to scope, quantities, estimates, schedules, escalation, and contingencies.

9.2.3 While much focus is placed on the quality of the IGEs, other estimates are equally and possibly more important. It is highly advisable that all critical estimates, schedules, and the resulting TPCS receive a quality review by a senior estimator within a formal process. When cost estimates are subject to an ATR or independent cost review, the quality responsibility remains within the estimating office that produced the estimate. The earlier estimates used for budgeting, programming, and congressional authorization and funding are very important management tools that should not be overlooked, underutilized, or unsupported by the PDT.

9.3 Agency Technical Review.

9.3.1 It has become more commonplace for upper management to require an ATR (formerly known as an independent technical review). An ATR is an independent technical review, which is a critical examination by a qualified person or technical team outside the submitting district that is not involved in the day-to-day technical work that supports a decision document. The review products normally include all documents, including the TPC. Documents include scoping information, plans and specifications, reports, quantities, estimates, schedules, risk analyses, and record of DQC. For the cost data, the ATR may include the TPC or specific portions of the TPC. The ATR can be performed at any stage of product development, even during construction as a measure of quality, confidence, and reliability.

9.3.2 HQUSACE mandates that the National Planning Centers of Expertise coordinate with the Cost Engineering Center of Expertise (CX) at the Walla Walla District for ATR of cost estimates, construction schedules, and contingencies included in all decision documents requiring Congressional authorization. The Cost Engineering CX will assign the reviewer(s) to the review teams and will utilize the USACE personnel and/or private sector to assure highly qualified persons are available to conduct these reviews. This approach will provide consistency in business practices and in the use of cost engineering tools. The Cost Engineering CX also developed a technical review checklist (appendix F) to assist the Cost Estimator on the PDT and the ATR team to ensure that the critical project planning, design, and engineering data are made available prior to preparation of the TPC estimate (appendix B of ER 1110-2-1302). This checklist is intended to serve as guidance, is considered a living document, and can be changed to better serve the product under review.

9.3.3 An ATR during the reconnaissance phase shall concentrate on evaluation of the overall project plans, on the initial cost estimates, and on the PMP. Reviewers shall also evaluate the schedule, budget, and work plan proposed in the PMP for the feasibility phase (refer to ER 1110-2-1150).

9.3.4 An ATR for the feasibility phase, as a minimum, must verify that the level of engineering is sufficient to substantiate both the screening level comparative cost estimates and the BCE with contingencies to support selection of the recommended plan and to establish the baseline schedule and cost estimate with contingencies.

9.3.5 Senior estimators, preferably USACE regional technical experts, shall be used for ATRs. A-Es shall use senior experienced cost engineers or estimators, who are certified by a professional estimating organization, to conduct their product ATRs. The ATR process requires a formalized comment and resolution process.

9.3.6 In order to receive a certification, the ATR process requires a formalized comment and resolution process. It is important that the reviewer be given the opportunity to formally place the comments, consider comment responses, back check the revised products, and close out all comments as having been resolved. For the TPC, the certification shall document the final acceptance date, the accepted cost, and schedule to ensure the integrity of what product has been certified and to what value.

9.4 Independent External Peer Review. Like the ATR, an IEPR may be required by upper management. An IEPR is an independent review of the technical efficacy of a decision document by a review organization external to USACE. The term “external” implies non-USACE or non-governmental review. An IEPR is conducted on projects that meet mandatory or discretionary triggers outlined in Engineer Circular 1105-2-410, Review of Decision Documents. Similar to the ATR process, a formalized comment resolution process must take place and may fall under scrutiny through FOIA. Often times, the IEPR occurs at the same time as an ATR. IEPR coordination is critical regarding timeliness and funding, because the IEPR commonly requires a contractual process to fund the IEPR.